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# COMPREHENSIVE DATA HANDLING SYSTEM (CDHS), EMISSIONS INVENTORY SUBSYSTEM PROGRAM DOCUMENTATION

IBM Federal Systems Division

Prepared for:

Environmental Protection Agency

July 1973

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16. ABSTRACT

The Emissions Inventory Subsystem of the Comprehensive Data Handling System provides a systematic method for collecting this data in a data base that will provide a central source for the information needed to help control air pollution. This document is intended to provide a more detailed knowledge of the programing logic of the Emission Inventory Subsystem (EIS) of the Comprehensive Data Handling System (CDHS). Section 2.0 contains an overview of the EIS system, a brief functional description of each component program comprising the system and a detailed discussion of the system master file and the general transaction cards required to build the master file. Section 3.0 through 6.0 contain descriptions of the program logic, organization, data formats and subroutines of each program in the EIS system. The sections are organized as follows; File Maintenance and Retrieval, Output programs, Data Conversion programs and Emission Factors Table programs. The EIS programs are documented by first describing their hierarchical top-down structure and then giving detailed descriptions of each main module within the structure. Thus, the serious EIS user can find his way directly into virtually any subroutine of a given program where he will then find the programming details in the structured code. In addition, descriptions of all the system inline and control type data areas and hierarchical flow charts of each program as well as all the crucial high level modules within each program are provided.

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by

International Business Machines Corporation
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18100 Frederick Pike
Gaithersburg, Maryland 20760

Contract No. 68-02-0638

EPA Project Officer: Lloyd Hedgepeth

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Office of Air and Water Programs
Office of Air Quality Planning and Standards
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July 1973

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## 1.0 INTRODUCTION

This document is intended to provide a more detailed knowledge of the programming logic of the Emission Inventory Subsystem (EIS) of the Comprehensive Data Handling System (CDHS). With this goal in mind the document is organized in the following manner:

- Section 2.0 - Similar to Section 2.0 of the EIS users guide. Contains an overview of the EIS system, a brief functional description of each component program comprising the system and a detailed discussion of the system master file and the general transaction cards required to build the master file.

- Section 3.0 - through 6.0 - Contain descriptions of the program logic, organization, data formats and subroutines of each program in the EIS system. The sections are organized as follows:

  Section 3.0 - File Maintenance and Retrieval

  Section 4.0 - Output programs

  Section 5.0 - Data Conversion programs

  Section 6.0 - Emission Factors Table programs

In general, each program in the EIS system is organized in the top-down manner in which higher level programming modules execute one or more lower level modules to perform specific functional tasks. These lower level modules may in turn execute still lower level modules to perform other specific tasks. Each module has one entry and one exit only. Thus, each program basically consists of a hierarchical structure of programming modules.

In addition, each program in the EIS system is programmed using structured programming techniques. These techniques include using only three basic types programming construction blocks (IF/ELSE, DO and PROCESS) and preclude the use of explicit branches. These techniques, along with the top-down organization, make for programs which are extremely readable with straightforward logic and no branching to confuse the program flow.

Because of the advanced manner in which the EIS system was developed, it became obvious that the standard method of program documentation, instruction by instruction and field by field, would not provide that level of information about the programs that we deemed necessary for valid understanding. Therefore, we have documented the EIS programs by first describing their hierarchical top-down structure and then giving detailed descriptions of each main module within the structure. Thus, the serious EIS user can find his way directly into virtually any subroutine of a given program where he will then find the programming details in the structured code.

In addition, we have provided descriptions of all the system inline and control type data areas and hierarchical flow charts of each program as well as all the crucial high level modules within each program.

## 2.0 EMISSIONS INVENTORY SUBSYSTEM (EIS) OVERVIEW

When dealing with atmospheric pollution, it is necessary to amass, catalog, sort, evaluate, and perform calculations upon large volumes of data. The Emissions Inventory Subsystem of the Comprehensive Data Handling System provides a systematic method for collecting this data in a data base that will provide a central source for the information needed to help control air pollution. If the system is to be helpful it must maintain the data base, keeping the information current, and provide a means for access to the information, presenting it in a usable form.

The Emissions Inventory Subsystem provides the ability to create and maintain, and to retrieve and print data from the data base. The creation and maintenance is accomplished with the File Maintenance program. This program allows the user to keep his data base information current and useful. Access to the data base information is provided by the Retrieval program set. These programs provide the means of extracting desired information from the data base. The output print programs are then used to convert the extracted information to a form readable by the user. These three functions form the basic system.

In addition to the basic system, several preprocessor and postprocessor programs are provided which perform functions necessary to make this system compatible with existing systems. Other programs provide services which help make the maintenance process automatic. All of the system programs are described in detail in the following sections.

## 2.1 ORGANIZATION

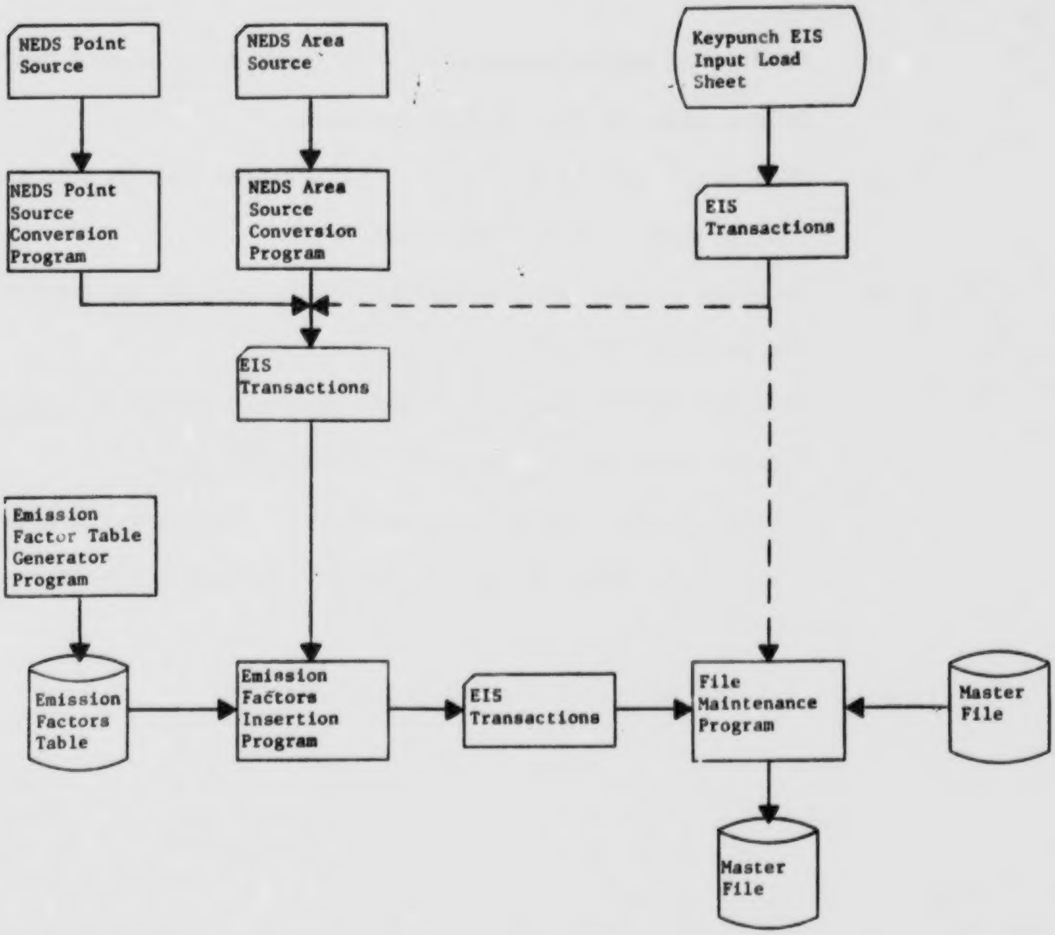
The Emission Inventory Subsystem of CDHS is organized around two main programs, File Maintenance and Retrieval. There are ten other programs in the system that perform service functions. The interface for the programs that feed the File Maintenance program is the EIS transaction card. The Master File serves as the interface for the rest of the programs.

The EIS components are:

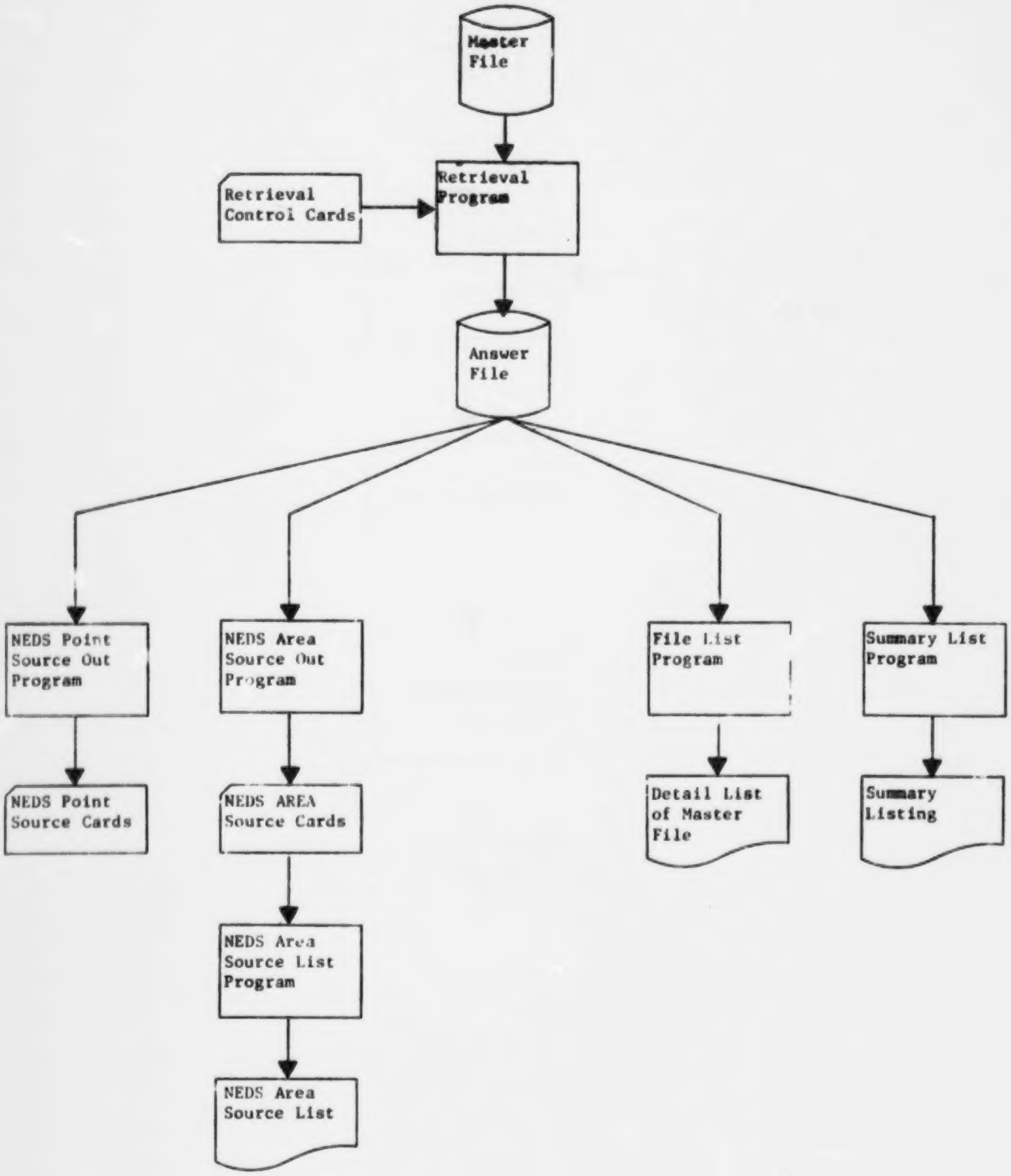
- File Maintenance - This program is used to create and maintain the Master File.
- Retrieval Language Processor - This program generates the retrieval program.
- Retrieval - This program is used to extract information from the Master File.
- File List - This program provides a detailed listing of the Master File.
- Summary Report Output - This program will produce a listing of emission totals for selected control breaks.
- NEDS Point Source Output - This program converts the Master File to NEDS Point Source card formats.
- NEDS Area Source Output - This program converts the Master File area records to NEDS Area Source card formats.
- NEDS Area Source Report - This program prints a formatted listing of NEDS Area Source cards.

- NEDS Point Source Conversion - This program converts NEDS Point Source cards to EIS transaction cards.
- NEDS Area Source Conversion - This program converts NEDS Area Source cards to EIS transaction cards.
- Emission Factor Table Generator - This program is used to generate the emission factors table.
- Emission Factor Insertion - This program inserts the emission factors into the (23 card) EIS transactions.
- Emission Factor Transaction Generator - This program generates transaction cards to update emission factors in the Master File.

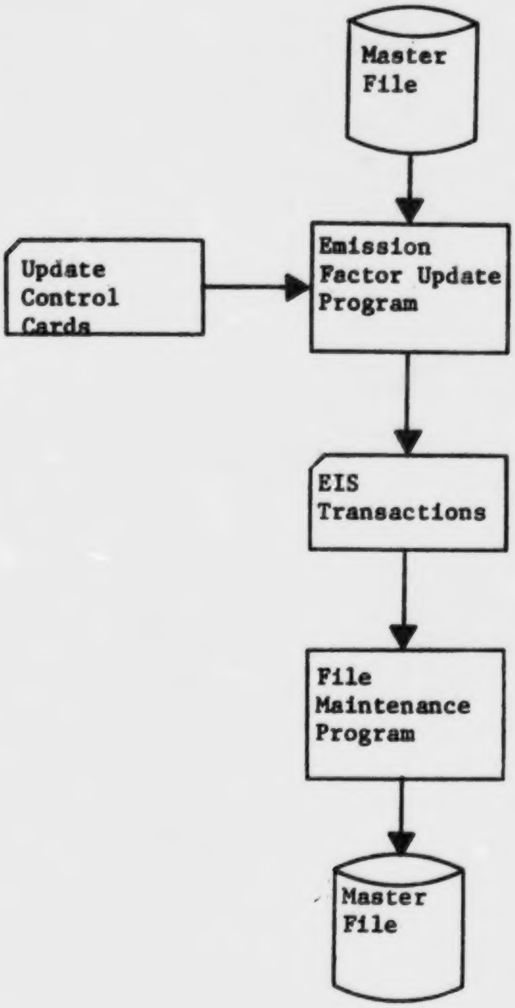
Figure 2.1-1 illustrates the flow of the EIS system.


NEDS Point Source
NEDS Area Source
Keypunch EIS Input Load Sheet
NEDS Point Source Conversion Program
NEDS Area Source Conversion Program
EIS Transactions
EIS Transactions
Emission Factor Table Generator Program
Emission Factors Table
Emission Factors Insertion Program
EIS Transactions
File Maintenance Program
Master File
Master File

EIS System Flow
Figure 2.1-1


Master File
Retrieval Control Cards
Retrieval Program
Answer File
NEDS Point Source Out Program
NEDS Area Source Out Program
File List Program
Summary List Program
NEDS Point Source Cards
NEDS AREA Source Cards
Detail List of Master File
Summary Listing
NEDS Area Source List Program
NEDS Area Source List

EIS System Flow
Figure 2.1-1 (cont.)

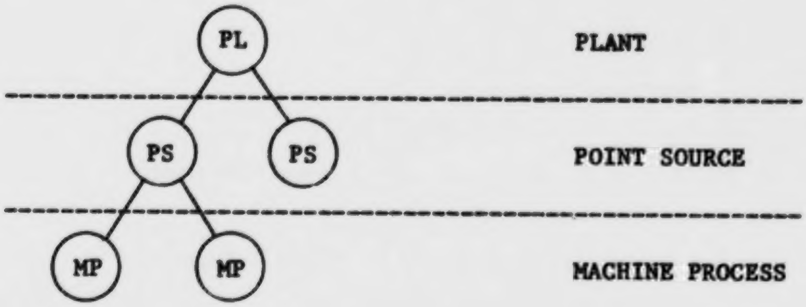

Master File
Update Control Cards
Emission Factor Update Program
EIS Transactions
File Maintenance Program
Master File

EIS System Flow
Figure 2.1-1 (cont.)

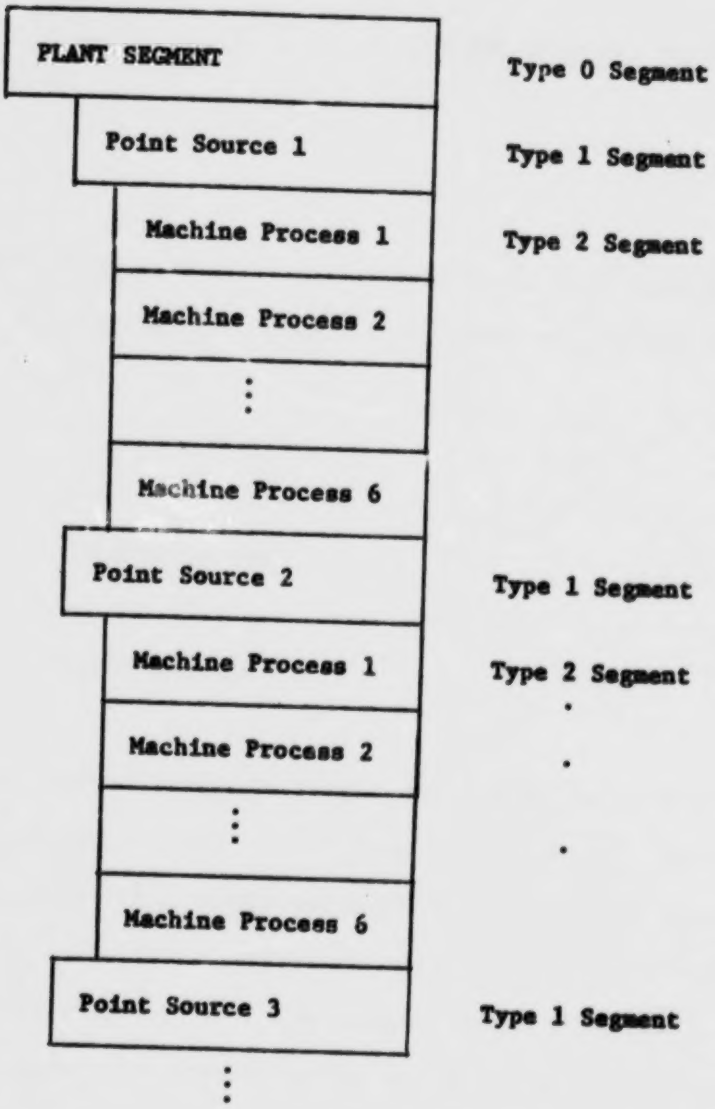
## 2.2 COMMUNICATION AND DATA FORMATS

### 2.2.1 MASTER FILE

The EIS master file is a three level hierarchical file with three different segment types. The highest, or master record level segment is called the plant segment. There is no limit to the number of master records allowed on an EIS master file. Subordinate to each master record (plant segment) may be up to 99 point source segments, each describing a different source of pollution (air stack) within the plant described by the plant segment. And subordinate to each point source segment are 1 to 6 machine process segments, each describing a different polluting process or machine feeding into the given point source. Figure 2.2.1-1 illustrates the hierarchical structure of an EIS master record.



The format of each segment type on the master file is illustrated in Figure 2.2.1-2. Each field illustrated relates directly to a field on one of the input transaction cards.


PLANT SEGMENT
Type 0 Segment
Point Source 1
Type 1 Segment
Machine Process 1
Type 2 Segment
Machine Process 2
Machine Process 6
Point Source 2
Type 1 Segment
Machine Process 1
Type 2 Segment
Machine Process 2
Machine Process 6
Point Source 3
Type 1 Segment

- o unlimited plant segments (type 0)
- o up to 99 point source segments (type 1 subordinate to each plant segment.
- o up to 6 machine process segments (type 2) subordinate to each point source

EIS MASTER RECORD STRUCTURE
Figure 2.2.1-1

**Fixed (Plant) Segment** (Segment 0)

| Position | Format | | Symbol | Description |
|---|---|---|---|---|
| 1 - 2 | xx | | Numeric | State Code |
| 3 - 6 | xxxx | | Numeric | County Code |
| 7 - 9 | xxx | | Numeric | AQCR Number |
| 10 - 13 | xxxx | | Numeric | Plant Id |
| 14 - 18 | xxxxx | * | Numeric | Date of Segment[1] |
| 19 - 21 | xxx | * | Numeric | Segment Id |
| 22 - 24 | xxx | * | Alphanumeric | User Control Region |
| 25 - 26 | xx | * | Alphanumeric | Local Control |
| 27 - 38 | x-x | * | Alphanumeric | User Plant Id |
| 39 - 42 | xxxx | | Numeric | City |
| 43 - 44 | xx | | Numeric | UTM Zone |
| 45 | A | | Alphabetic | Ownership |
| 46 - 60 | A-A | | Alphabetic | Contact |
| 61 - 70 | x-x | * | Alphanumeric | Telephone |
| 71 - 80 | x-x | * | Alphanumeric | Principal Product |
| 81 - 128 | x-x | | Alphanumeric | Name and Address |
| 129 - 132 | xxxx | * | Numeric | Number of Employees |
| 133 - 138 | xxxxx.x | * | Numeric | Property Area |
| 139 - 186 | x-x | * | Alphanumeric | Mailing Address |

EIS Master Record Format

Figure 2.2.1-2

**Point Source Segment** (Segment 1)

| **Position** | **Format** | | **Symbol** | **Description** |
|---|---|---|---|---|
| 1 - 2 | xx | | Numeric | State Code |
| 3 - 6 | xxxx | | Numeric | County Code |
| 7 - 9 | xxx | | Numeric | AQCR Number |
| 10 - 13 | xxxx | | Numeric | Plant Id |
| 14 - 18 | xxxxx | * | Numeric | Date of Segment[1] |
| 19 | x | * | Numeric | Segment Id |
| 20 - 21 | xx | | Numeric | Segment Id Sequence |
| 22 - 23 | xx | | Numeric | Point Id (NEDS) |
| 24 - 26 | xxx | * | Alphanumeric | Point Id (User) |
| 27 - 30 | xxxx | | Numeric | SIC Code |
| 31 - 32 | xx | | Numeric | IPP Code |
| 33 - 36 | xxx.x | | Numeric | UTM Horizontal Coordinates |
| 37 - 41 | xxxx.x | | Numeric | UTM Vertical Coordinates |
| 42 - 47 | x-x | * | Numeric | Latitude |
| 48 - 54 | x-x | * | Numeric | Longitude |
| 55 - 62 | x-x | | Numeric | Annual Throughput |
| 63 - 67 | xxxxx | | Numeric | Normal Operating |
| 68 - 72 | xxxxx | | Numeric | Boiler Design Capacity |
| 73 - 75 | xx.x | | Numeric | Space Heat |
| 76 - 79 | xxxx | | Numeric | Stack Height |
| 80 - 82 | xx.x | | Numeric | Stack Diameter |
| 83 - 86 | xxxx | | Numeric | Stack Temperature |

EIS Master Record Format

Figure 2.2.1-2 (Continued)

| Position | Format | | Symbol | Description |
|---|---|---|---|---|
| 87 - 93 | x-x | | Numeric | Exhaust Flow Rate |
| 94 - 98 | xxxxx | * | Numeric | Velocity |
| 99 - 102 | xxxx | | Numeric | Plume-Height |
| 103 - 106 | xxxx | | Numeric | Points with Common Stack |
| 107 | x | | Numeric | Compliance Status |
| 108 - 111 | xxxx | | Numeric | Compliance Schedule |
| 112 - 117 | x-x | | Numeric | Compliance Update |
| 118 | x | | Numeric | ECAP |
| 119 - 130 | x-x | | Numeric | Control Regulations |
| 131 - 132 | xx | | Numeric | Number of Pollutants[2] |
| 133 - 137 | xxxxx | * | Numeric | Pollutant Id |
| 137 - 144 | xxxxx.xx | * | Numeric | Control Equipment Cost |
| 145 - 147 | xxx | | Numeric | Primary Control Equipment |
| 148 - 150 | xxx | | Numeric | Secondary Control Equipment |
| 151 - 153 | xx.x | | Numeric | Estimated Control Efficiency |
| 154 - 160 | x-x | | Numeric | Emissions Estimate |
| 161 - 167 | x-x | * | Numeric | Emissions Measured |
| 168 - 174 | x-x | | Numeric | Allowable Emissions |
| 175 | x | * | Numeric | Emission Units |
| 176 | x | | Numeric | Estimation Method |
| 177 | x | * | Numeric | Test Method |

Note: Positions 133 - 177 may be repeated up to 15 times to allow for 16 pollutants from a single source. The Number of Pollutants field determines the number of repetitions.

EIS Master Record Format

Figure 2.2.1-2 (Continued)

## Machine Process Segment (Segment 2)

| Position | Format | | Symbol | Description |
|---|---|---|---|---|
| 1 - 2 | xx | | Numeric | State Code |
| 3 - 6 | xxxx | | Numeric | County Code |
| 7 - 9 | xxx | | Numeric | AQCR Number |
| 10 - 13 | xxxx | | Numeric | Plant Id |
| 14 - 18 | xxxxx | * | Numeric | Date of Segment[1] |
| 19 | x | * | Numeric | Segment Id |
| 20 - 21 | xx | | Numeric | Segment 1 Id |
| 22 - 23 | xx | * | Numeric | Segment 2 Id |
| 24 - 31 | x-x | | Numeric | SCC Code |
| 32 - 36 | xxxxx | * | Numeric | BEC Code |
| 37 | x | * | Numeric | Fuel Units |
| 38 - 44 | x-x | | Numeric | Fuel, Process, Solid Waste |
| 45 - 51 | xxxx.xxx | | Numeric | Maximum Design |
| 52 - 54 | x.xx | | Numeric | Sulfur Content |
| 55 - 57 | xx.x | | Numeric | Ash Content |
| 58 - 62 | xxxxx | | Numeric | Heat Content |
| 63 | x | | Numeric | Confidentiality of Data |
| 64 | A | | Alphabetic | Source Code |
| 65 - 89 | x-x | | Alphanumeric | Source Description |
| 90 | x | * | Alphabetic | Emission Factor Source |
| 91 - 92 | xx | * | Numeric | Number of Emission Factors[2] |
| 93 - 97 | xxxxx | * | Numeric | Pollutant Id |

EIS Master Record Format

Figure 2.2.1-2 (Continued)

| Position | Format | Symbol | Description |
|---|---|---|---|
| 98 - 106 | xxxxxx.xxx | * Numeric | Emission Factor |
| 107 | A | * Alphabetic | Ash/Sulfur Code |
| 108 | x | * Numeric | Emission Factor Units |

Note: Positions 93-108 may be repeated up to 15 times to allow for 16 emission factors per process. The number of Emission Factors field determines the number of repetitions.

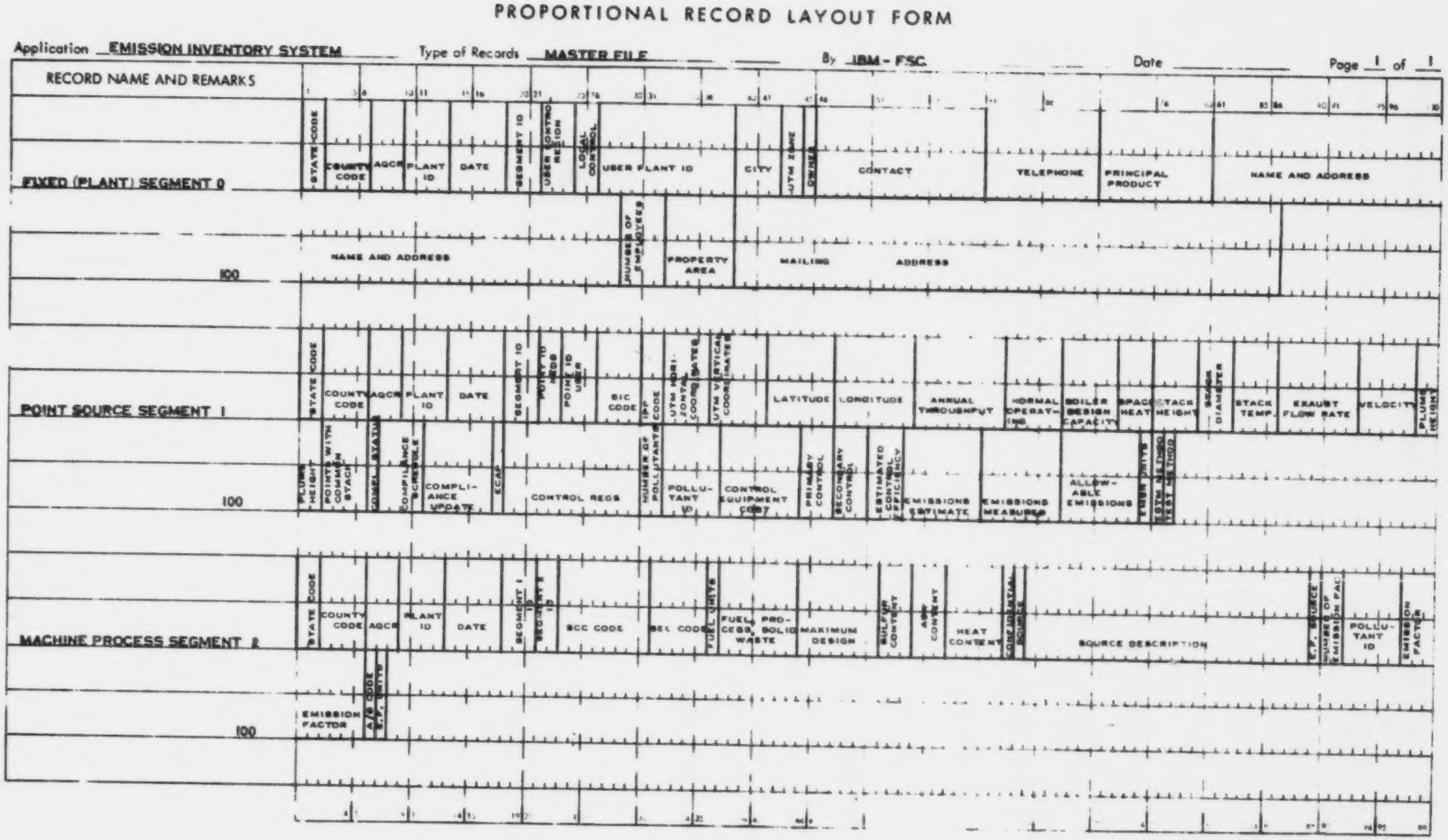
* Not part of NEDS point source file.

1 Only year portion of date obtained from NEDS point source file. Remainder of field filled with zeroes.

2 Determined by File Maintenance program.

EIS Master Record Format

Figure 2.2.1-2 (Continued)



PROPORTIONAL RECORD LAYOUT FORM

Application EMISSION INVENTORY SYSTEM Type of Records MASTER FILE By IBM-FSC Date ______ Page 1 of 1

| RECORD NAME AND REMARKS | |
|---|---|
| FIXED (PLANT) SEGMENT 0 | STATE CODE<br>COUNTY CODE<br>AQCR<br>PLANT ID<br>DATE<br>SEGMENT ID<br>USER CONTROL REGION<br>LOCAL CONTROL<br>USER PLANT ID<br>CITY<br>UTM ZONE<br>OWNER<br>CONTACT<br>TELEPHONE<br>PRINCIPAL PRODUCT<br>NAME AND ADDRESS |
| 100 | NAME AND ADDRESS<br>NUMBER OF EMPLOYEES<br>PROPERTY AREA<br>MAILING ADDRESS |
| POINT SOURCE SEGMENT 1 | STATE CODE<br>COUNTY CODE<br>AQCR<br>PLANT ID<br>DATE<br>SEGMENT ID<br>POINT ID NEDS<br>POINT ID USER<br>SIC CODE<br>IPP CODE<br>UTM HORIZONTAL COORDINATES<br>UTM VERTICAL COORDINATES<br>LATITUDE<br>LONGITUDE<br>ANNUAL THROUGHPUT<br>NORMAL OPERATING<br>BOILER DESIGN CAPACITY<br>SPACE HEAT<br>STACK HEIGHT<br>STACK DIAMETER<br>STACK TEMP.<br>EXHAUST FLOW RATE<br>VELOCITY<br>PLUME HEIGHT |
| 100 | PLUME HEIGHT<br>POINTS WITH COMMON STACK<br>COMPL. STATUS<br>COMPLIANCE SCHEDULE<br>COMPLIANCE UPDATE<br>ECAP<br>CONTROL REGS<br>NUMBER OF POLLUTANTS<br>POLLUTANT ID<br>CONTROL EQUIPMENT COST<br>PRIMARY CONTROL<br>SECONDARY CONTROL<br>ESTIMATED CONTROL EFFICIENCY<br>EMISSIONS ESTIMATE<br>EMISSIONS MEASURED<br>ALLOWABLE EMISSIONS<br>EMISN UNITS<br>ESTM METHOD<br>TEST METHOD |
| MACHINE PROCESS SEGMENT 2 | STATE CODE<br>COUNTY CODE<br>AQCR<br>PLANT ID<br>DATE<br>SEGMENT 1 ID<br>SEGMENT 2 ID<br>SCC CODE<br>SEL CODE<br>FUEL UNITS<br>FUEL, PROCESS, SOLID WASTE<br>MAXIMUM DESIGN<br>SULFUR CONTENT<br>ASH CONTENT<br>HEAT CONTENT<br>CONFIDENTIAL SOURCE<br>SOURCE DESCRIPTION<br>E.P. SOURCE<br>NUMBER OF EMISSION FAC<br>POLLUTANT ID<br>EMISSION FACTOR |
| 100 | EMISSION FACTOR<br>A/B CODE<br>E.F. UNITS |

EIS Master Record Format

Figure 2.2.1-2 (Continued)

### 2.2.2 TRANSACTION RECORDS

The master file is constructed from the information contained on the EIS input transaction cards. There are three classes (or types) of cards: a zero card, a one card and a two card. The zero card contains general identification for the plant or source; the one card contains information relative to specific emission points within a source; the two card contains fuel and process information. The following paragraphs explain the contents of each field on the transaction cards. Figure 2.2.2-1 illustrates the format of the cards. The same formats are used to enter both point source data and area source data. However, the meanings of some fields will be changed when area source data is to be entered.

Card Columns 1-18 of all Cards (Key)

| CC | Format | Symbol | Description |
|---|---|---|---|
| 1 - 2 | xx | Numeric Code | State Code |
| 3 - 6 | xxxx | Numeric Code | County Code |
| 7 - 9 | xxx | Numeric Code | AQCR Number |
| 10 - 13 | xxxx | Numeric Code | Plant Id |
| 14 - 18 | xxxxx | Numeric | Date of Record |

Card 01 - Plant Identification

| CC | Format | Symbol | Description |
|---|---|---|---|
| 19 - 21 | xxx | Alphanumeric Code | Control Region |
| 22 - 23 | xx | Alphanumeric Code | Local Control |
| 24 - 35 | x-x | Alphanumeric Code | Plant Id |
| 36 - 39 | xxxx | Numeric Code | City |
| 40 - 41 | xx | Numeric Code | UTM ZONE |
| 42 | A | Alphabetic Code | Ownership |
| 43 - 57 | A-A | Alphabetic | Contact |
| 58 - 67 | x-x | Alphanumeric | Telephone |
| 68 - 77 | x-x | Alphanumeric | Principal Product |
| 78 - 79 | xx | Numeric | Card Number |
| 80 | x | Alphabetic Code | Transaction Code |

EIS TRANSACTION CARDS

Figure 2.2.2-1

Card 02 - Plant Identification

| CC | Format | Symbol | Description |
|---|---|---|---|
| 19 - 66 | x-x | Alphanumeric | Name and Address |
| 67 - 70 | x-x | Numeric | Number of Employees |
| 71 - 76 | xxxxx.x | Numeric | Property Area |
| 77 | | | Not Used |
| 78 - 79 | xx | Numeric | Card Number |
| 80 | x | Alphabetic Code | Transaction Code |

Card 03 - Plant Identification

| CC | Format | Symbol | Description |
|---|---|---|---|
| 19 - 66 | x-x | Alphanumeric | Mailing Address |
| 67 - 77 | | | Not Used |
| 78 - 79 | xx | Numeric | Card Number |
| 80 | x | Alphabetic Code | Transaction Code |

EIS TRANSACTION CARDS

Figure 2.2.2-1 (Cont.)

**Card 11 - Point Source Parameters**

| CC | Format | Symbol | Description |
|---|---|---|---|
| 19 - 20 | xx | Numeric | Segment ID |
| 21 - 22 | xx | Numeric | Point Id (NEDS) |
| 23 - 25 | xxx | Alphanumeric | Point Id (Local) |
| 26 - 29 | xxxx | Numeric | SIC Code |
| 30 - 31 | xx | Numeric | IPP Code |
| 32 - 35 | xxx.x | Numeric | UTM Horizontal Coordinates |
| 36 - 40 | xxxx.x | Numeric | UTM Vertical Coordinates |
| 41 - 46 | x-x | Numeric | Latitude |
| 47 - 53 | x-x | Numeric | Longitude |
| 54 - 61 | x-x | Numeric | % Annual Throughput |
| 62 - 66 | xxxxx | Numeric | Normal Operating |
| 67 - 71 | xxxxx | Numeric | Boiler Design Capacity |
| 72 - 74 | xx.x | Numeric | Space Heat % |
| 75 - 77 | | | Not Used |
| 78 - 79 | xx | Numeric | Card Number |
| 80 | x | Alphabetic Code | Transaction Code |

EIS TRANSACTION CARDS

Figure 2.2.2-1 (cont.)

**Card 12 - Point Source Parameters**

| CC | Format | Symbol | Description |
|---|---|---|---|
| 19 - 20 | xx | Numeric | Segment ID |
| 21 - 24 | xxxx | Numeric | Stack Height |
| 25 - 27 | xx.x | Numeric | Stack Equivalent Diameter |
| 28 - 31 | xxxx | Numeric | Stack Temperature |
| 32 - 38 | x-x | Numeric | Exhaust Flow Rate |
| 39 - 43 | xxxxx | Numeric | Velocity |
| 44 - 47 | xxxx | Numeric | Plume Height |
| 48 - 51 | xxxx | Numeric | Points with Common Stack |
| 52 | x | Numeric | Compliance Status |
| 53 - 56 | xxxx | Numeric | Compliance Schedule |
| 57 - 62 | xxxxxx | Numeric | Compliance Update |
| 63 | x | Numeric | ECAP |
| 64 - 75 | x-x | Numeric | Control Regulations |
| 76 - 77 | | | Not Used |
| 78 - 79 | xx | Numeric | Card Number |
| 80 | x | Alphabetic Code | Transaction Code |

EIS TRANSACTION CARDS

Figure 2.2.2-1 (cont.)

## Card 13 - Point Source Parameters

| CC | Format | Symbol | Description |
|---|---|---|---|
| 19 - 20 | xx | Numeric | Segment ID |
| 21 - 25 | xxxxx | Numeric | Pollutant ID |
| 26 - 32 | xxxxxx.xx | Numeric | Control Equipment Cost |
| 33 - 35 | xxx | Numeric | Primary Control Equipment |
| 36 - 38 | xxx | Numeric | Secondary Control Equipment |
| 39 - 41 | xx.x | Numeric | Estimated Control Efficiency |
| 42 - 48 | xxxxxxxx | Numeric | Emissions Estimate |
| 49 - 55 | xxxxxxxx | Numeric | Emissions Measured |
| 56 - 62 | xxxxxxxx | Numeric | Allowable Emissions |
| 63 | x | Numeric | Emission Units |
| 64 | x | Numeric | Estimation Method |
| 65 | x | Numeric | Test Method |
| 66 - 77 | | | Not Used |
| 78 - 79 | xx | Numeric | Card Number |
| 80 | x | Alphabetic | Transaction Code |

EIS TRANSACTION CARDS

Figure 2.2.2-1 (cont.)

Card 21 - Fuel, Process Parameters

| CC | Format | Symbol | Description |
|---|---|---|---|
| 19 - 20 | xx | Numeric | Segment 1 ID |
| 21 - 22 | xx | Numeric | Segment 2 ID |
| 23 - 30 | x-x | Numeric Code | SCC Code |
| 31 - 35 | xxxxx | Numeric Code | BEC Code |
| 36 | x | Numeric Code | Fuel Units |
| 37 - 43 | xxxxxxx | Numeric | Fuel, Process, Solid Waste |
| 44 - 50 | xxxxx.xxx | Numeric | Maximum Design |
| 51 - 53 | x.xx | Numeric | Sulfer Content |
| 54 - 56 | xx.x | Numeric | Ash Content |
| 57 - 61 | xxxxx | Numeric | Heat Content |
| 62 - 77 | | | Not Used |
| 78 - 79 | xx | Numeric | Card Number |
| 80 | x | Alphabetic Code | Transaction Code |

EIS TRANSACTION CARDS

Figure 2.2.2-1 (cont.)

**Card 22 - Fuel, Process Parameters**

| CC | Format | Symbol | Description |
|---|---|---|---|
| 19 - 20 | xx | Numeric | Segment 1 ID |
| 21 - 22 | xx | Numeric | Segment 2 ID |
| 23 | x | Numeric | Confidentiality of data |
| 24 | x | Alphabetic | Source Code |
| 25 - 49 | x-x | Alphanumeric | Source Description |
| 50 | x | Alphabetic | Emission Factor Source |
| 51 - 77 | | | Not Used |
| 78 - 79 | xx | Numeric | Card Number |
| 80 | x | Alphabetic Code | Transaction Code |

EIS TRANSACTION CARDS

Figure 2.2.2-1 (cont.)

**Card 23 - Fuel, Process Parameters**

| CC | Format | Symbol | Description |
|---|---|---|---|
| 19 - 20 | xx | Numeric | Segment 1 ID |
| 21 - 22 | xx | Numeric | Segment 2 ID |
| 23 - 27 | xxxxx | Numeric | Pollutant ID Code |
| 28 - 36 | xxxxxxx.xxx | Numeric | Emission Factor |
| 37 | x | Alphabetic Code | Ash/Sulfur Code |
| 38 | x | Numeric Code | Emission Factor Units |
| 39 - 54 | | | Repeat CC 23 - 38 |
| 55 - 70 | | | Repeat CC 23 - 38 |
| 71 - 77 | | | Not Used |
| 78 - 79 | xx | Numeric | Card Number |
| 80 | x | Alphabetic Code | Transaction Code |

EIS TRANSACTION CARDS

Figure 2.2.2-1 (cont.)

- Card Columns 1-18 of all cards:

1. State Code: State identification number as defined by the SAROAD air quality numbering system.

2. County Code: Codes to be used are listed in the SAROAD Station Coding Manual for Aerometric Sampling Networks, Publication No. APTD-0907 of the Environmental Protection Agency.

3. AQCR Number: Number for the Air Quality Control Region in which the Plant is located.

4. Plant ID: This field identifies each source in a county. The numbering system is sequential, starting with the number one and continuing until all facilities containing point sources that are located in a given county are assigned a number.

5. Date of Record: The Julian date for the data recorded on the card. The format for this field is YYDDD.

- **Card 01**

1. Control Region: A user defined field to identify state or county control areas.

2. Local Control: A user defined field to identify plants that are physically in one control region but have control responsibility in another region.

3. Plant ID: A user defined field to be used if the local identification conventions differ from NEDS.

4. City: The four-digit SAROAD code number corresponding to the city in which the source is located. There are a few cities in the United States that are not considered to be inside any county but are considered independent entities. In such cases, enter the city code in both the City and County Code fields.

5. UTM Zone: The zone number must be known in order to locate the point source via the UTM coordinate system; this number is found on all USGS maps showing UTM coordinates. Although most states are within a single UTM zone, a few states and counties are in two UTM zones. For this reason a UTM zone number is required for each record.

6. Ownership: A single alphabetic character ownership code. The code should be selected from the following list:

| Symbol | Ownership |
|---|---|
| P | Private |
| L | Local Government |
| S | State Government |
| F | Federal Government |
| U | Utility |

7. Contact: The last name of the person responsible for pollution control activity at the source. If the responsible individual is not identifiable, then record a descriptive and appropriate title.

8. Telephone: The area code and telephone number of the person to be contacted should be entered in this field.

9. Principal Product: A brief description of the principal product produced by this plant.

10. Card Number: 01

11. Transaction Code: The transaction codes are:

A - Add

C - Change

D - Delete.

- **Card 02**

1. Name and Address: Provide a descriptive name for the facility and a usable mailing address. Use common abbreviations as much as possible. The address should include a street number, city and a zip code. The zip code should appear in the last five positions of the field.

2. Number of Employees: Record the number of persons actually working at this location.

3. Property Area: The area, to the nearest tenth acre, of the land occupied by the facility.

4. Card Number: 02

5. Transaction Code: The transaction codes are:
   - A - Add
   - C - Change
   - D - Delete.

- Card 03

1. Mailing Address: The address of the person to contact if it is different than the establishment name and address.

2. Card Number: 03.

3. Transaction Code: The transaction codes are:

   A - Add

   C - Change

   D - Delete.

- Card 11

1. Segment ID: Each point source set (11, 12, and a 13 card) creates a point source segment in the master file. Each point source segment under the same facility segment must have a unique segment ID number. This number must also be used to reference a particular segment when making a change or deleting a segment.

2. Point ID (NEDS): This is a sequential number designated for each pollutant discharge point within the facility.

3. Point ID (Local): This is a field for a user defined point source identification when the NEDS Point Id is not sufficient to show local control.

4. SIC code: This information is necessary to use the source data for modeling air quality. Enter the appropriate Standard Industrial Classification code.

5. IPP code: This column should be completed with the standard process code.

6. UTM Horizontal and Vertical Coordinates: The UTM coordinate system is another means of identifying the location of the point source. Coordinates are obtained from USGS maps or their equivalent with scales less than 1:62,500. All spaces in these columns must be filled in with numbers and zeros. Accuracy to 0.1 kilometer accuracy is desired.

7. Latitude and Longitude: This is an alternate means of identifying the location of the point source. Coordinates may be obtained from USGS maps or their equivalent.

8. % Annual Throughput: The annual production, consumption, throughput, or other valid number representing the operating of the source should be proportionally divided into the four 3-month categories listed below. The wieghted portion of production occurring in each category is reported as a percentage of total annual throughput. The field is divided into four equal subfields of two numbers each. The first two positions are for December through February. The next two are for March through May. The next two are for June through August. The last two are for September through November.

9. Normal Operating: The hours per day, days per week, and weeks per year that the source operates under normal and usual conditions should be entered here.

10. Boiler Design Capacity: Numerical values in this field should be entered if the boiler burns fuel to heat water or steam, or if it is normally sold according to the heating capacity (BTU per hour). Units are in millions of BTU per hour based on the maximum capacity or design of the boiler.

11. Space Heat %: An estimate of the percent of total fuel used for space heating at the plant should be entered here. If no fuel is used for space heating, enter zeros in this field.

12. Card Number: 11

13. Transaction Code: The transaction codes are:

    A - Add
    C - Change
    D - Delete

- Card 12

1. Segment ID: Enter the same number as in the Segment ID of the 11 card.

2. Stack Height: If the exact location of the discharge of pollutants is well defined there will be a stack or some other enclosed, constrained, or physically-bounded area where pollutants are emitted. In such instances, the stack height is the vertical distance between the point of emission and ground level. If no stack can be identified or there is a changing locus of emissions within the facility then complete only the Plume Height field and leave the rest of the stack data blank.

3. Stack Equivalent Diameter: The stack diameter is the inside diameter of a round gas exit at the point of emission; for non-round exits, it is an equivalent diameter calculated from the cross-sectional area at point of discharge. Using a measured or estimated cross-sectional area, the equivalent diameter (De) is calculated as follows:

$$De = 1.128 \sqrt{A}$$

where A is in square feet.

4. **Stack Temperature:** The temperature of the exhaust stream at the stack exit should be reported in degrees Fahrenheit under normal operating conditions. If measured temperatures are not available, an estimate to the nearest 50°F should be made.

5. **Exhaust Flow Rate:** This number should be specified by recording the design or maximum exhaust-gas volume unless actual measurements are available. Units are actual cubic feet per minute and represent the total volume of exhaust gas released at the operating temperature of the stack (assume gas pressure is the same as normal atmospheric pressure).

6. **Velocity:** This number should be specified by recording the design or maximum exhaust-gas velocity unless actual measurements are available. Units are feet per minute.

7. **Plume Height:** This field is to be filled in if the previous fields on stack data are all blank. The plume height is a gross estimate and is used only when the source has no definable stack.

8. **Points with Common Stack:** Columns 48 and 49 contain the NEDS Point ID of the first point source discharging through the stack. Columns 50 and 51 contain the NEDS Point ID of the last point source discharging through the stack. For a complete definition of common stack see EPA publication APTD-1135, Guide For Compiling A Comprehensive Emission Inventory, for March 1973.

9. Compliance Status: One of the following codes must be selected to record the present status of the source under existing legal requirements:

| Code | |
|---|---|
| 1 | Source is in compliance with the most stringent air pollution control requirements. |
| 2 | Source is not in compliance with existing legislation and no variance has been given. |
| 3 | Source is not in compliance with existing legislation but a variance has been given. |
| 4 | Compliance status is unknown. |

10. Compliance Schedule: If the compliance status code is 2 or 3, enter the year and month by which this source must be in compliance.

11. Compliance Update: The day, month, and year of the most recent change in compliance status for the source be entered in this field. Leave the field blank if compliance status has been reported as unknown (code 4). If the source is in compliance with existing air pollution control legislation, then record the record the time that such legislation was enacted.

12. ECAP: Certain point sources are required to submit to government agencies on Emergency Control Action Program

that specifies a detailed plan for immediately reducing emissions whenever air pollution in an area is considered an emergency condition. The following list shall be used to denote whether or not an ECAP has been submitted to an appropriate government agency. Leave blank if status is unknown.

0 ECAP is not required

1 ECAP is required but has not been submitted

2 ECAP has been submitted.

13. Control Regulations: This field is used to identify air pollution control regulations that are in effect and apply to the source.

14. Card Number: 12

15. Transaction Code: The transaction codes are:

A - Add

C - Change

D - Delete

- Card 13

1. Segment ID: Enter the same number as in the Segment Id of the 11 card.

2. Pollutant ID: This field is a five digit code that represents the pollutants whose emissions are being measured. Source is SAROAD Parameter Coding Manual, EPA Publication No. APTD-0633.

3. Control Equipment Cost: Enter the annual cost of maintenance and operation of pollution control equipment.

4. Primary Control Equipment: This field should be completed with the Control Equipment Identification Code. Only control devices that reduce the uncontrolled emission normally associated with the specific source process should be reported.

5. Secondary Control Equipment: If there is an additional control device installed for this pollutant enter the Control Equipment Identification Code in this field.

6. **Estimated Control Efficiency:** The overall collection efficiencies in weight percent of all control equipment at the point source should be entered. Assume that the pollutant load entering the control equipment is the normal, uncontrolled quantity for that specific process.

7. **Emissions Estimate:** The annual, controlled emissions from the point source, in tons per year, should be entered here. These calculations should include the effect of pollutant removal by installed control equipment.

8. **Emissions Measured:** The annual, controlled emissions from the point source, in tons per year, as actually measured by test equipment should be entered here. These measurements can be compared against the estimates to check the validity of the emission factors.

9. **Allowable Emissions:** Entered here should be the maximum emissions, in tons per year, that the source is legally allowed to discharge into the atmosphere.

10. **Emission Units:** This field is for future expansion of the system. It will eventually allow the user to specify units for the emissions in other than NEDS units. It is currently ignored by the system.

11. Estimation Method: The following code list must be used to specify the method used to ascertain the estimated emissions:

| Code | Description of Method |
|---|---|
| 0 | Not applicable (if emissions are negligible) |
| 1 | Stack-test results or other emission measurement |
| 2 | Material balance using engineering knowledge and expertise of process |
| 3 | Emission calculated using emission factors |
| 4 | Guess |

If code 3 is used the file maintenance program will calculate the estimated emissions if all the factors are present.

12. Test Method: A user defined code to indicate the method used to ascertain the measured emissions.

13. Card Number: 13

14. Transaction Code: The transaction codes are:

A - Add
C - Change
D - Delete.

o **Card 21**

1. Segment 1 ID: Enter the same number as in the Segment ID of the 11 card for the point source to which this segment belongs.

2. Segment 2 ID: Each Fuel-Process set (21,22,23) creates a Fuel-Process segment in the master file. Each Fuel-Process segment under the same point source segment must have a unique Segment 2 ID number. This number must also be used to reference a particular segment when making a change or deleting a segment.

3. SCC Code: The Source Classification Code process description that most nearly describes the process should be entered by its eight-digit numerical code. If the most appropriate SCC description appears to be significantly different from the actual process, enter nothing in this field, but enter NEW SCC NEEDED in the Source Description field of the 22 card.

4. BEC Code: Enter the Basic Equipment Classification Code that describes the equipment or process for this source. The last two digits are used to sequentially number identical units at the same source.

5. **Fuel Units:** This field is for future expansion of the system. It will eventually allow the user to specify units for the fuel-process field in other than NEDS units. It is currently ignored by the system.

6. **Fuel, Process, Solid Waste:** The annual figures will be reported in this field using the units associated with the SCC code for this process.

7. **Maximum Design:** The maximum hourly design rate of the most important process equipment, or the upper operating limit that generally would not be exceeded in normal practice, should be entered here. Units are expressed in those corresponding to the SCC for the process.

8. **Sulfur and Ash Content:** Entries are to be made in these columns for all combustion processes. If the process does not burn fuel, leave the field blank.

9. **Heat Content:** This field is to be completed only when the process involves combustion. Units are millions of BTU per SCC.

10. **Card Number:** 21

11. **Transaction Code:** The transaction codes are:

- A - Add
- C - Change
- D - Delete.

- Card 22

1. Segment 1 ID: Enter the same number as on the Segment 1 ID of the 21 card.

2. Segment 2 ID: Enter the same number as on the Segment 2 ID of the 21 card.

3. Confidentiality of Data: Process information occasionally is collected by a government agency under a guarantee that the data will be treated in a confidential manner and will not be released to the public. This column indicates whether or not any data for this source are officially considered confidential. A one (1) indicates confidential classification, a two (2) no classifiaction and a blank indicates an unknown status.

4. Source Code: this is needed for NEDS reporting. Enter the following codes for the process category: B - Boiler, P - Process, C - Other Combustion unit.

5. Source Description: Enter a brief description of the source or comments as needed.

6. Emission Factor Source: If this field contains a T the Emission Factors insertion program will insert the appropriate Emission Factors from a table of SCC codes.

7. Card Number: 22

8. Transaction Code: The transaction codes are:

   A - Add

   C - Change

   D - Delete.

- Card 23

1. Segment 1 ID: Enter the same number as in the Segment 1 ID of the 21 card.

2. Segment 2 ID: Enter the same number as in the Segment 2 ID of the 21 card.

3. Pollutant ID Code: This field is a five digit code that represents the pollutant whose emissions are being measured. Source is SAROAD Parameter Coding Manual, EPA Publication No. APTD-0633.

4. Emission Factor: The emission factor is a statistical average of the rate at which a pollutant is released to the atmosphere as a result of some activity, such as combustion or industrial production, divided by the level of that activity. The emission factors for each SCC may be found in the EPA publication Compilation of Air Pollutant Emission Factors, Publication No. AP-42.

5. Ash/Sulfur Code: This code indicates whether or not the Ash or Sulfur percentage is to be used in the calculation of the estimated emissions. The codes are: A - Ash, S - Sulfur and blank is neither apply.

6. Emission Factor Units: This field is for future expansion. Eventually it will indicate the units in which the emission

factors are expressed. The emission factors are now treated as standard NEDS units. Reference OAP Publication No. AP-42.

7. Card Number: 23

8. Transaction Code: The transaction codes are:

A - Add
C - Change
D - Delete

Note: Card columns 23 to 38 may be repeated two more times on the same 23 card. This allows the storing of up to three sets of emission factors information on each card.

## 3.0 FILE MAINTENANCE AND RETRIEVAL

There are two major EIS programs for building, maintaining and retrieving data from the EIS master file. These are the File Maintenance program and the Retrieval program. The Retrieval program actually consists of two separate programs which work together to process a query to completion, the Retrieval Language Processor program and the Retriever program.

## 3.1 FILE MAINTENANCE

File maintenance performs two basic functions, the creation of a new system master file and the modification of an existing system master file. The program can operate in any of three modes to support the two basic functions. These modes are add, change and delete. Every transaction card input to the file maintenance program must be either an add, change or delete card, identified by an A, C or D in card column 80.

Add cards are used to create a new system master file and to add new records to an existing master file. Change cards are used to change any field in any record on an existing master file except record keys, set ID's and pollution ID's. Delete cards are used to delete an entire logical record (a plant segment with all subordinate point source and machine process segments), any point source segment (with all subordinate machine process segments) or any machine process segment from an existing master file.

The file maintenance program works in the following manner. The old system master file is read in its entirety once from beginning to end. All input transaction cards are passed against the file in the order they are read. According to the action called for on the card records are added to the file, changed on the file or deleted from the file. The result of the file maintenance program is a new system master file, modified according to the transaction cards. In the case of file create, there is, of course, no old master file. Thus, all the add transaction cards are used to create new records and add them to the new master file.

### 3.1.1 ORGANIZATION

The file maintenance program is organized in a top-down fashion in which higher-level modules usually execute one or more lower-level modules to perform specific functional tasks. Thus, the program is comprised of many relatively small functional modules organized roughly into a hierarchical tree structure. The following are the higher level routines of the file maintenance program.

- ROOT-SEGMENT

  This is the highest level routine of file maintenance. All other program subroutines are subordinate to this one. This routine performs lower level routines which open all the required files, initialize data fields, initiate processing of the old system master file (if any), process all transaction cards, finish copying the old system master file to the new and close all system files. The only STOP RUN statement in the whole program is in this routine. Thus, through the use of perform statements this top level routine is the whole file maintenance program.

- MAIN-LOOP

  This subroutine, performed by the ROOT-SEGMENT routine, performs a lower level subroutine to read the next transaction card. Then, depending on what type of card was read, another subroutine will be performed which will add a record to the file, change a record on the file, delete a record from the file or process an invalid transaction card.

- ADD-RECORD

  This subroutine, performed by MAIN-LOOP, processes the adding of a record to the system master file. Depending on the transaction type of the add card, a subroutine will be performed which will add a root (plant) segment to the file, add a point source and all related machine process records to the file or process an invalid transaction card.

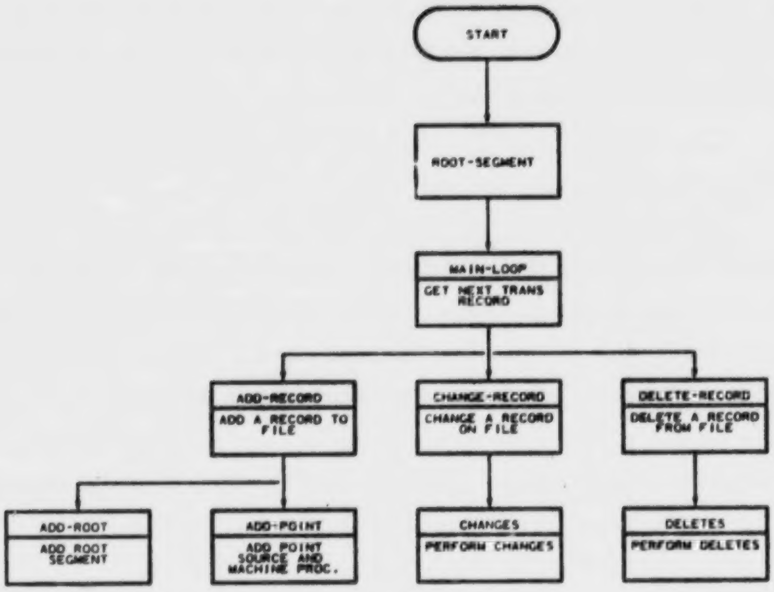
- CHANGE-RECORD

  This subroutine, performed by MAIN-LOOP, processes the changing of a record on the system master file. This subroutine performs lower level subroutines to edit the change transaction card, locate and read into core the record to be changed, perform all changes to the record and write the updated record back out on the new master file.

- DELETE-RECORD

  This subroutine, performed by MAIN-LOOP, processes the deletion of a record from the system master file. This subroutine performs lower level subroutines to edit the delete transaction card, locate the record to be deleted and delete the record from the new master file.

Figure 3.1-1 illustrates the organization of the File Maintenance component.


START
ROOT-SEGMENT
MAIN-LOOP
GET NEXT TRANS RECORD
ADD-RECORD
ADD A RECORD TO FILE
CHANGE-RECORD
CHANGE A RECORD ON FILE
DELETE-RECORD
DELETE A RECORD FROM FILE
ADD-ROOT
ADD ROOT SEGMENT
ADD-POINT
ADD POINT SOURCE AND MACHINE PROC.
CHANGES
PERFORM CHANGES
DELETES
PERFORM DELETES

File Maintenance Organization
Figure 3.1-1

### 3.1.2 COMMUNICATION AND DATA FORMATS

The following COBOL working storage section fields are the major control and data areas internal to the file maintenance program.

ERR-1 thru ERR-19 - The number of each of the nineteen error messages, corresponding to the messages themselves in ERROR-MSGS.

ERR-CODE - Contains the number of the error message to be printed whenever an error is detected.

LINE-MAX - Number of lines to print per page of file maintenance output listing. Currently set to 52.

MAX-CARD-1 - Maximum number of type 13 transaction cards allowed. Currently set to 16.

MAX-CARD-2 - Maximum number of type 23 transaction cards allowed. Currently set to 16.

MAX-SET-2 - Maximum number of type two segments subordinate to a single type one segment. Currently set to six.

**CONTROL-SWITCHES** - These are the program switches to control internal logic. The main switches are:

> **EOF-SW** - Controls the top level looping of the MAIN-LOOP subroutine. Turned on at transaction file end.
>
> **READ-SW** - Determines whether or not the next transaction card should be read (in MAIN-LOOP), depending on whether or not the current card has yet to be processed.

**ERROR-MSGS** - The nineteen messages used to describe any detected errors. These messages are referenced by setting the field ERR-CODE to one of the values contained in ERR-1 thru ERR-19.

**OLD-CONTROL** - Contains the record Key, date and segment 1 and 2 ID fields of the current old master file record residing in core.

**SAVE-ALL-SET-2** - Contains all the type two segments (up to six) subordinate to the type 1 segment contained in SAVE-POINT during change and delete logic.

**SAVE-POINT** - Contains the type one segment related to the type two segments stored in SAVE-ALL-SET-2 during change and delete logic.

SAVE-CARD - Contains the first two cards of any three card set (01, 02, and 03; 11, 12 and 13; 21, 22 and 23) during the building of that set during add processing.

The Working Storage fields MAX-CARD-1 and MAX-CARD-2 indicate the maximum number of pollutants each record in the master file will now handle. To increase or decrease the number change the "OCCURS 1 TO 16 TIMES" clause for the repeating portion of the MSTR-POINT-SOURCE record and the MSTR-MACHINE-PROCESS record. MAX-CARD-1 and MAX-CARD-2 must be changed to the same number as the 16 is changed to. All of the programs using the master file must be recompiled to incorporate this change.

The Working Storage field MAX-SET-2 determines the maximum number of two segments that can be held in core at any given time. If this number is changed the "SAVE-SET2 OCCURS 6 TIMES" statement must be changed also. Whenever any of these "MAX" fields are increased the amount of core storage must be increased when the programs are to be run.

### 3.1.3 ROUTINES

The higher level file maintenance routines ROOT-SEGMENT, MAIN-LOOP, ADD-RECORD, CHANGE-RECORD and DELETE-RECORD are described in section 3.1.1. The routines described here are the lower level routines which are performed by those higher level routines.

The routines described here basically consist of one structured paragraph which performs other subroutines to carry out the necessary functions. Thus, each routine is relatively easy to follow in a functional manner since the detailed code resides in lower level performed subroutines.

- ADD-ROOT

  This subroutine, performed by ADD-RECORD, will add a root segment (plant segment, type zero) record to an EIS master file. The required 01,02 and 03 type transaction cards are read and edited and subroutine LOCATE-SET0 is performed to read the old master file (if any) and determine where on the file the new root segment should be added. The segment is then built from the three input cards and ~~added to the new~~ master file.

- ADD-POINT

  This subroutine, performed by ADD-RECORD, will add a point source segment (type 1 segment) and all subordinate machine process segments (type 2 segments) to an EIS master file. The 11, 12, multiple 13, and all occurrances of the 21, 22 and multiple 23 type transaction cards are read and edited. Subroutine ADD-SET1 is performed to locate the place in the old master file (if any) where the new segments are to be added, perform the CALCULATIONS subroutine to calculate the estimated emissions, and add the new segments to the new master file.

- CHANGES

This subroutine, performed by CHANGE-RECORD, actually performs the changes, as defined by the change transaction card, to the old master file. The record that the changes are to be made to is read into core and the change card is then scanned for non-blank data fields. Each such field is used to replace the corresponding field in the record. After all the change fields on the card are updated to the record, the updated record is written into the new master file.

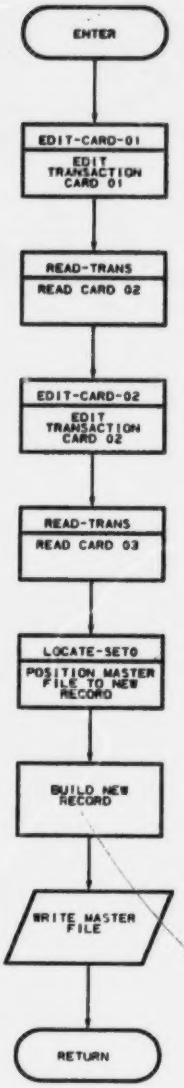
- DELETES

This subroutine, performed by DELETE-RECORD, actually performs the deletion of the logical segment type as specified on the delete transaction card. If segment type zero (plant segment) is to be deleted, all physical records with the specified key will be deleted from the file. If segment type one (point source segment ) is to be deleted, all physical records with the specified key and the specified set one ID will be deleted from the file. If segment type two (machine process segment) is to be deleted, the one physical record with the specified key, set one ID and set two ID will be deleted from the file.

- CALCULATIONS

This subroutine is performed whenever a type 1 segment is added to the master file or changed,or whenever any type two segment is changed or deleted. The subroutine calculates the estimated-emissions for each pollution ID in the type 1 and type 2 segments. Basically, the computation is performed in three parts. First, in subroutine PRELIMINARY-COMPUTATION, the fuel process rate is multiplied by the emission factor. Next, in subroutine ASH-SULFUR-ADJUSTMENT, the product of the previous multiplication is multiplied by whichever (if any) content is specified, ash or sulfur. Last, in subroutine FINAL-COMPUTATION, the adjusted product is multiplied by the control efficiency factor, reduced by the emission reduction amount and divided by pounds per ton. A field over-flow during any arithmetic operation will result in a final estimated emission of zero.

Figures 3.1-2 through 3.1-6 illustrate the organization of the File Maintenance routines.


ENTER
EDIT-CARD-01
EDIT TRANSACTION CARD 01
READ-TRANS
READ CARD 02
EDIT-CARD-02
EDIT TRANSACTION CARD 02
READ-TRANS
READ CARD 03
LOCATE-SET0
POSITION MASTER FILE TO NEW RECORD
BUILD NEW RECORD
WRITE MASTER FILE
RETURN

File Maintenance Routine ADD-ROOT
Figure 3.1-2

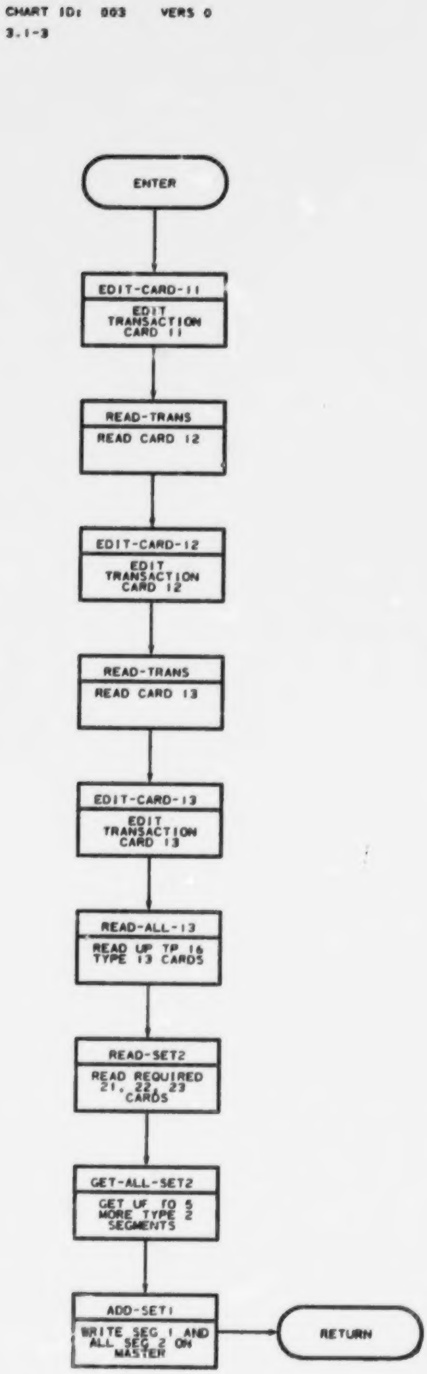
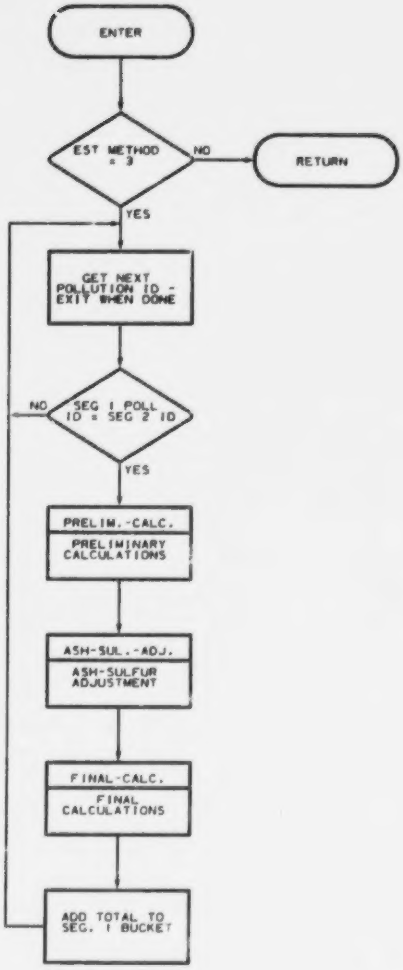
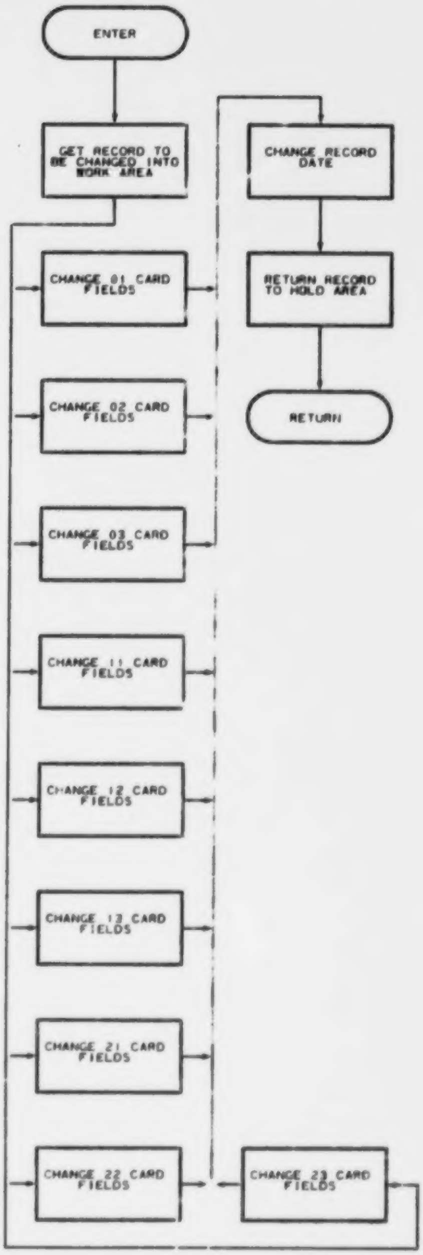


CHART ID: 003 VERS 0
3.1-3
ENTER
EDIT-CARD-11
EDIT TRANSACTION CARD 11
READ-TRANS
READ CARD 12
EDIT-CARD-12
EDIT TRANSACTION CARD 12
READ-TRANS
READ CARD 13
EDIT-CARD-13
EDIT TRANSACTION CARD 13
READ-ALL-13
READ UP TP 16 TYPE 13 CARDS
READ-SET2
READ REQUIRED 21, 22, 23 CARDS
GET-ALL-SET2
GET UP TO 5 MORE TYPE 2 SEGMENTS
ADD-SET1
WRITE SEG 1 AND ALL SEG 2 ON MASTER
RETURN

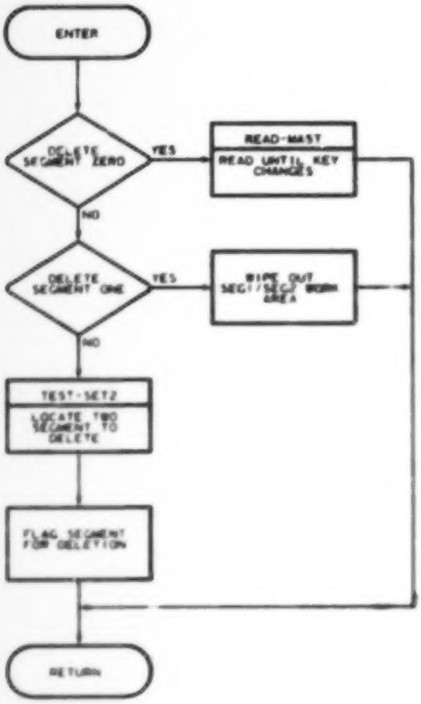
File Maintenance Routine ADD-POINT
Figure 3.1-3


ENTER
EST METHOD = 3
NO
RETURN
YES
GET NEXT POLLUTION ID - EXIT WHEN DONE
NO
SEG 1 POLL ID = SEG 2 ID
YES
PRELIM.-CALC.
PRELIMINARY CALCULATIONS
ASH-SUL.-ADJ.
ASH-SULFUR ADJUSTMENT
FINAL-CALC.
FINAL CALCULATIONS
ADD TOTAL TO SEG. 1 BUCKET

File Maintenance Routine CALCULATIONS
Figure 3.1-4


ENTER
GET RECORD TO BE CHANGED INTO WORK AREA
CHANGE 01 CARD FIELDS
CHANGE 02 CARD FIELDS
CHANGE 03 CARD FIELDS
CHANGE 11 CARD FIELDS
CHANGE 12 CARD FIELDS
CHANGE 13 CARD FIELDS
CHANGE 21 CARD FIELDS
CHANGE 22 CARD FIELDS
CHANGE 23 CARD FIELDS
CHANGE RECORD DATE
RETURN RECORD TO HOLD AREA
RETURN

File Maintenance Routine CHANGES
Figure 3.1-5


ENTER
DELETE SEGMENT ZERO
YES
READ-MAST
READ UNTIL KEY CHANGES
NO
DELETE SEGMENT ONE
YES
WIPE OUT SEG1/SEG2 WORK AREA
NO
TEST-SET2
LOCATE TBD SEGMENT TO DELETE
FLAG SEGMENT FOR DELETION
RETURN

File Maintenance Routine DELETES
Figure 3.1-6

## 3.2 RETRIEVAL

The EIS retrieval function is performed by two separate programs, the Retrieval Language Processor and the Retriever.

### 3.2.1 RETRIEVAL LANGUAGE PROCESSOR

The Language Processor component reads a set of retrieval cards, edits the cards and generates a COBOL program which when executed will perform the specified retrieval and sort functions.

The working storage section of the language processor contains several sets of COBOL skeleton statements. These are statements which when taken together do not form a valid COBOL program since some are out of sequence, others are incomplete and additional ones must be generated. As the language processor edits a user query, it completes, selects and writes the skeleton statements in a sequence determined by the user specified cards. When editing is completed, a valid COBOL program has been assembled and written on the COBOL input data set.

The generated COBOL program is in one of two forms depending on whether or not the query specifies a sort. The two forms are essentially similar except that all statements required by the sort function are not generated when the query does not specify a sort.

### 3.2.1.1 ORGANIZATION

The Language Processor component is organized as a control segment with three subordinate routines; the control card processing routine, the if editing routine and the sort editing routine.

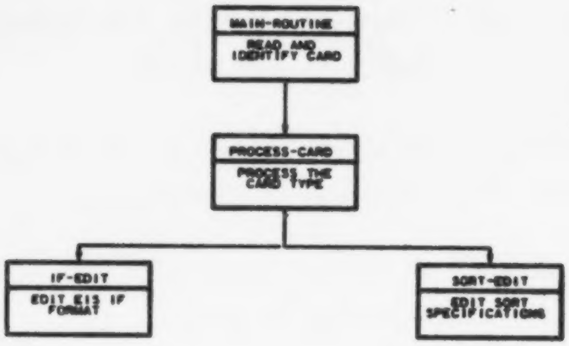
- CONTROL SEGMENT - Opens the data sets required by the component, passes control to the card processing routine and when control is returned closes the data sets and terminates the run.

- CONTROL CARD PROCESSING - Reads the retrieval control cards, identifies each as to type and passes control to the appropriate processing paragraph. When an end-of-file is detected on the input data set control returns to the main routine.

- IF EDITING - Reads and edits the EIS format retrieval specification cards.

- SORT EDITING - Reads and edits the sort specification cards.

Figure 3.2.1-1 illustrates the organization of the Retrieval Language Processor component.


MAIN-ROUTINE
READ AND IDENTIFY CARD
PROCESS-CARD
PROCESS THE CARD TYPE
IF-EDIT
EDIT EIS IF FORMAT
SORT-EDIT
EDIT SORT SPECIFICATIONS

Retrieval Language Processor Organization
Figure 3.2.1-1

### 3.2.1.2 COMMUNICATION AND DATA FORMATS

The following defines the usage of the main working storage data areas.

- SK-INDEX-L - Contains a subscript value for the skeleton statement in which the next sort key length will be placed.
- SK-INDEX-N - Contains a subscript value for the skeleton statement in which the next sort key name will be placed.
- SK-INDEX-T - Contains a subscript value for the skeleton statement in which the next sort key type will be placed.
- COPY-SW - May contain ON or OFF. If ON retrieval specifications in inline COBOL format were read. If OFF the cards were not read.
- EDIT-SW - May contain ON or OFF. Contains ON when performing the if editing or sort editing routine. Contains OFF after detecting a blank logical connector field or after five sort cards.
- EOJ-SW - May contain ON or OFF. If ON, a data set end-of-file has been detected.
- ERROR-SW - May contain ON or OFF. If ON, some type of editing error has been detected.
- FOUND-SW - May contain ON or OFF. If ON, the argument being searched for was found.
- INPUT-SW - May contain ON or OFF. If OFF no input cards were read.
- READ-SW - May contain ON or OFF. If OFF a card is not to be read from the input data set.

- REL-OPERATOR-VALUES - A table containing the translation of the EIS fixed format relational operator code to COBOL relational operator words.

- SET-1-IMAGES - Contains the skeleton statements for the identification division, the data division and first part of the procedure division.

- SET-2-IMAGES - Contains the skeleton statements for the middle portion of the procedure division.

- SET-3-IMAGES - Contains the skeleton statements for the end of the procedure division.

- SORT-1-IMAGES - Contains the skeleton statements which complete the build sort key paragraph.

- IF-1-IMAGES - Contains the skeleton statements which are added to the qualification paragraph for each EIF fixed format IF clause.

- ELEMENT-NAME-VALUES - Contains all data file field names which can be referenced in a query. The first byte indicates the field mode. The next two bytes contain the field length. The next byte is an indicator (I) if the field is in the type 1 repetitions. The remaining 30 bytes contain the field name.

- ROUTINE-COPE-VALUES - Contains the sequencing control matrix for the control card processing routine. The EXPECTED-CARD-TYPE and CARD-CODE values determine the $i_{ij}$ entry of the matrix. This entry contains the argument of a go to depending on statement to pass control to the various paragraphs of the control card processing routine.

- CARD-SEQUENCE-VALUES - A table containing valid control card names and two numbers. The first is the CARD-CODE which is used with the sequencing control matrix and the second is the code of the next expected control card.

### 3.2.1.3 ROUTINES

The following subroutines are in the PROCESS-CARD main routine.

- PROCESS-CARD - This paragraph reads a card from the input data set, determines what type it is and passes control to one of the following paragraphs.

- CARD-INVALID-ERROR - This paragraph issues an error message indicating that the card just read is not a valid $$ control card.

- CARD-SEQUENCE-ERROR - This paragraph issues an error message indicating that the card just read is a $$ control card but it is out of sequence.

- QUERY-CARD - This paragraph performs the initialization that is required for the beginning of a query. It passes control to INITIALIZE-SORTKEY to initialize the sortkey length and name fields in the skeleton statements.

- END-CARD - This paragraph performs the required end of query functions. It adds the final skeleton statements to the COBOL program.

- SORT-CARD - This paragraph performs the initialization that is required to process the sort specification cards. These cards are processed by the SORT-EDIT routine which receives control from this paragraph. The skeleton statements necessary for the retriever sort function are written on the COBOL input data set.

- SORT-CARD-DEFAULT - This paragraph outputs the skeleton statements that do not pertain to retriever sort.

- IF-CARD - This paragraph performs the initialization required to process the EIS fixed format qualification specification cards. The IF-EDIT routine receives control and processes these cards. This paragraph adds the skeleton statements to complete the qualification paragraph of the retriever.

- IF-CARD-USER-INLINE - This paragraph passes control to the COPY-CARDS paragraph to copy the user specification cards from the input data set to the COBOL input data set.

- IF-CARD-USER-LIBRARY - This paragraph inserts the user member name into a skeleton statement and adds the statement to the COBOL input data set.

The following subroutines are in the IF-EDIT main routine:

- IF-EDIT - This paragraph passes control to the IF-EDIT-SEQUENCING paragraph if the edit switch is on. If not, an error message is issued.

- IF-EDIT-SEQUENCING - This paragraph passes control sequentially to each of the following paragraphs and then adds the four line clause to the COBOL input data set.

- IF-EDIT-LEFT-PARENS - This paragraph counts the number of left parentheses which precede the subject name.

- IF-EDIT-SUBJECT-NAME - This paragraph examines the subject name field for a valid name. If the name is invalid an error message is issued.

- IF-EDIT-RELATIONAL - This paragraph examines the relational operator field for a valid relational operator. If the operator is invalid an error message is issued.

- IF-EDIT-RIGHT-PARENS - This paragraph counts the number of right parentheses which follow the object name.

- IF-EDIT-OBJECT-LITERAL - This paragraph examines the object name field for an alphanumeric or numeric literal.

- IF-EDIT-OBJECT-NAME - This paragraph examines the object name field for a valid data file field name. If the name is invalid an error message is issued.

- IF-EDIT-LOGICAL - This paragraph examines the logical connector field for a valid connector. If not found, an error message is issued. The edit switch is turned off when the logical connector field is blank.

The following subroutines are in the SORT-EDIT main routine:

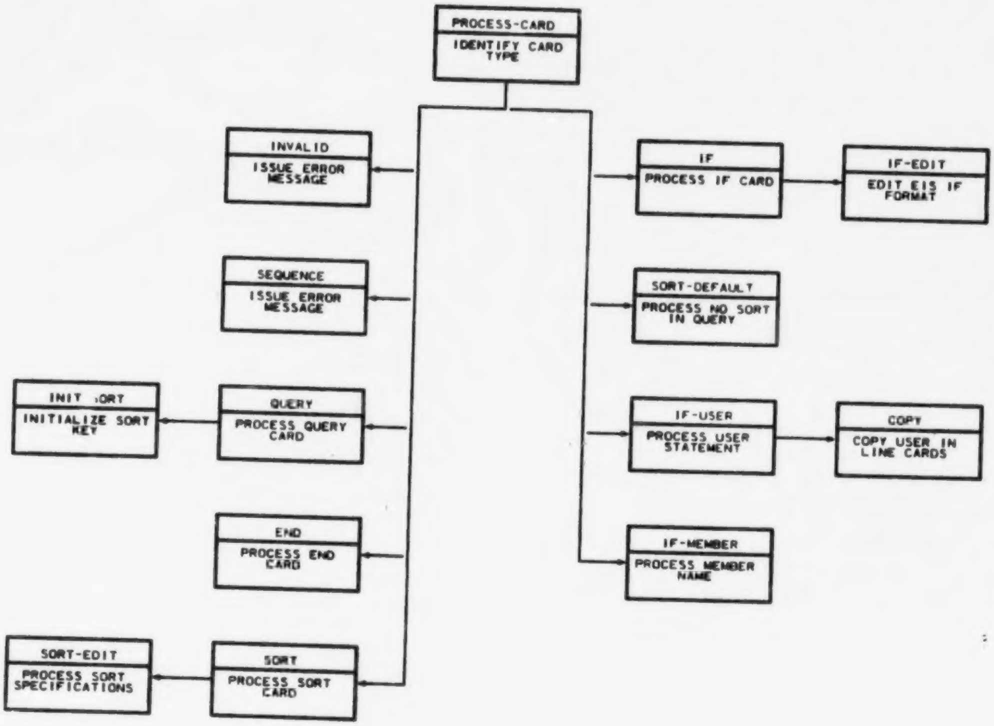
- SORT-EDIT - This paragraph passes control to the SORT-EDIT-SEQUENCING paragraph if the edit switch is on. If not, an error message is issued.

- SORT-EDIT-SEQUENCING - This paragraph passes control to each of the following paragraphs.

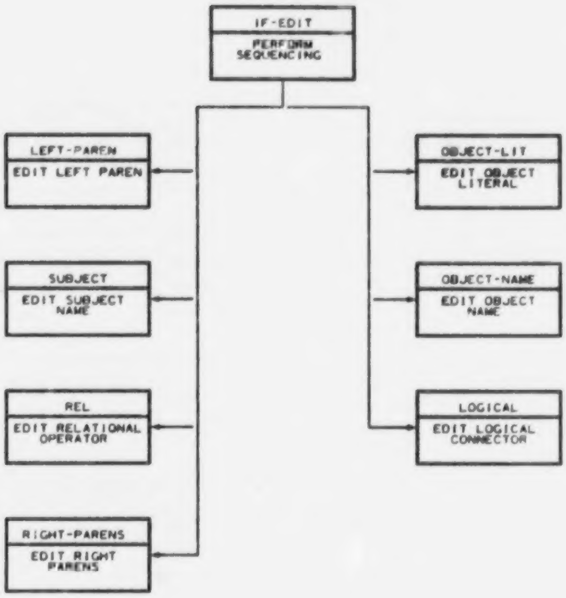
- SORT-EDIT-SUBJECT-NAME - This paragraph examines the subject name field for a valid data file field name. If invalid, an error message is issued. The sort type field is examined for a valid sort type word. The sortkey lengths and names are adjusted by this paragraph.

- SORT-NAME-COUNT - This paragraph counts the number of sort specification cards processed. When the count exceeds 5, the edit switch is turned off.

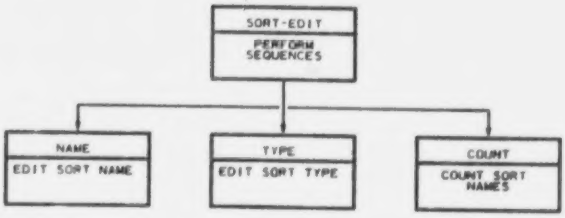
Figures 3.2.1-2 through 3.2.1-4 illustrate the organization of the Retrieval Language Processor routines.


PROCESS-CARD
IDENTIFY CARD TYPE
INVALID
ISSUE ERROR MESSAGE
SEQUENCE
ISSUE ERROR MESSAGE
INIT SORT
INITIALIZE SORT KEY
QUERY
PROCESS QUERY CARD
END
PROCESS END CARD
SORT-EDIT
PROCESS SORT SPECIFICATIONS
SORT
PROCESS SORT CARD
IF
PROCESS IF CARD
IF-EDIT
EDIT EIS IF FORMAT
SORT-DEFAULT
PROCESS NO SORT IN QUERY
IF-USER
PROCESS USER STATEMENT
COPY
COPY USER IN LINE CARDS
IF-MEMBER
PROCESS MEMBER NAME

Retrieval Language Processor Routine PROCESS-CARD
Figure 3.2.1-2


IF-EDIT
PERFORM SEQUENCING
LEFT-PAREN
EDIT LEFT PAREN
SUBJECT
EDIT SUBJECT NAME
REL
EDIT RELATIONAL OPERATOR
RIGHT-PARENS
EDIT RIGHT PARENS
OBJECT-LIT
EDIT OBJECT LITERAL
OBJECT-NAME
EDIT OBJECT NAME
LOGICAL
EDIT LOGICAL CONNECTOR

Retrieval Language Processor Routine IF-EDIT
Figure 3.2.1-3


SORT-EDIT
PERFORM SEQUENCES
NAME
EDIT SORT NAME
TYPE
EDIT SORT TYPE
COUNT
COUNT SORT NAMES

Retrieval Language Processor Routine SORT-EDIT
Figure 3.2.1-4

### 3.2.2 RETRIEVER

The Retriever component sequentially processes all logical records of a data file. Each logical record read is examined to determine if the qualification specifications are met. If so, the qualified record is placed either on the answer data set or the sort input data set. Qualified records on the sort data set will be sorted according to the sort specifications and then placed on the answer data set.

### 3.2.2.1 ORGANIZATION

The Retriever is organized as a control segment with three subordinate routines, the retrieval routine, the strip key routine and the set parameters routine. When a sort is not specified in the query, the strip key routine is omitted.

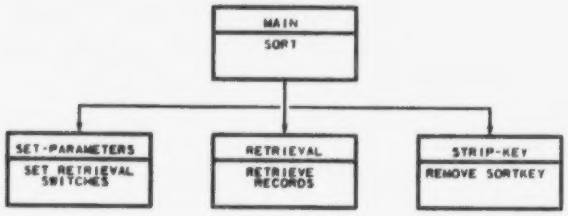
- CONTROL-SEGMENT - Opens the data sets required by the component and passes control to the set parameters routine which sets switches to indicate the retrieval functions. The control segment then either performs the retrieval routine if a sort was not specified or passes control to COBOL sort. The SORT statement, in turn, passes control to the retrieval routine, sorts the qualified records and then passes control to the strip key routine which removes the sortkeys from the sorted records and places them on the answer data set. The control segment will then close the data sets and terminate the run.

- RETRIEVAL - Reads a logical record from the data file, performs the qualification tests in the sequence determined by the switches set by the set parameters routine and writes the qualified record, if any, on the answer data set or the sort input data set.

- STRIP-KEY - Reads a physical record from the sort output data set and writes it on the answer data set.

- SET-PARAMETERS - Sets the switches which indicate the retrieval environment.

Figure 3.2.2-1 illustrates the organization of the Retriever component.


MAIN
SORT
SET-PARAMETERS
SET RETRIEVAL SWITCHES
RETRIEVAL
RETRIEVE RECORDS
STRIP-KEY
REMOVE SORTKEY

Retriever Organization
Figure 3.2.2-1

### 3.2.2.2 COMMUNICATION AND DATA FORMATS

- EMQSW - May contain TRUE or FALSE. If TRUE, the query is qualifying on a field name in the type 1 repetitions.
- EMSSW - May contain TRUE or FALSE. If TRUE, the query is sorting on a field name in the type 1 repetitions.
- EOJSW - May contain TRUE or FALSE. If TRUE, a data set end-of-file has been detected.
- FRDSW - May contain TRUE or FALSE. If TRUE, the first physical record read during the logical record-reading is not to be performed.
- LGLSW - May contain TRUE or FALSE. If TRUE, the logical record may be processed.
- LGLCSW - May contain TRUE or FALSE. If TRUE, the logical record reading is completed.
- QRSLT - May contain TRUE or FALSE. If TRUE, the type 0 record, the type 1 record and a single repetition has met the qualification specification.
- QRSLTA - May contain TRUE or FALSE. If TRUE, the type 0 record, the type 1 record and one or more of the repetitions has met the qualification specification.
- SRTSW - May contain TRUE or FALSE. If TRUE, the query has specified a sort.
- T2RSW - May contain TRUE or FALSE. If TRUE, the query has specified that the type 2 records are to be part of each qualified record.

- RECORD-EXPECTED - Contains the code of the next physical record that should be read in the logical record reading.

- RECORD-FOUND - Contains the code of the physical record that was just read.

- ROUTINE-CODE-VALUES - Contains the sequencing control matrix for the logical record reading. The RECORD-FOUND and RECORD-EXPECTED codes determine the $i_{ij}$ entry of the matrix. This entry contains the argument of a go to depending on statement to pass control to the various paragraphs of logical record reading routine.

- NRC0 - Contains the type 0 record.

- NRC1 - Contains the type 1 record fixed portion and one repetition. Retrieval qualification is performed on the data in the NRC0 and NRC1 areas.

- WRC1 - Contains the type 1 record and all its repetitions. During qualification the repetitions may be moved from this area to the NRC1 area.

- WRC2 - Contains the type 2 records.

### 3.2.2.3 ROUTINES

The following subroutines are in the RETRIEVAL main routine:

- PROCESS-FILE - This paragraph is the high level control for the retrieval routine. It passes control to the GET-LOGICAL-RECORD paragraph which reads a logical record. Then, depending on the switch settings control passes to either EMQUAL-EMSORT, EMQUAL-NO-EMSORT, or NO-EMQUAL-NO-EMSORT which performs the qualification. This process continues until an end-of-file occurs.

- EMQUAL-EMSORT -- This paragraph together with paragraph EMQUAL-EMSORT-A control the qualification tests when a repetition field is referenced in both the retrieval and sort specification. The repetitions of the type 1 record are processed in the following manner. The nth repetition in the WRC1 area is moved to the first repetition in the WRC1 area and the single repetition in the NRC1 area. The qualification paragraph is performed and if true the logical record consisting of the type 0 and the type 1 with one repetition is given to sort. This process repeats n times, the number of repetitions in the type 1 record.

- EMQUAL-NO-EMSORT - This paragraph together with paragraph EMQUAL-NO-EMSORT-A control the qualification tests when a repetition field is referenced in a retrieval specification. The nth repetition in the WRC1 area is moved to the mth repetition in the WRC1 area and the single repetition in the NRC1 area. The qualification is performed and if true m is stepped. The subscription steps from 1 to the number of repetitions while m steps from 1 to k where k is the number of repetitions that qualified. After all repetitions have been tested, the logical record consisting of the type 0 and the type 1 with m repetitions is written on the answer set or the sort input data set.

- NO-EMQUAL-NO-EMSORT - This paragraph is performed when the query does not reference a repetition field. The qualification is performed and if true the logical record consisting of the type 0 and the type 1 with all its repetitions are written on the answer set or the sort input data set.

- OUTPUT-SORT-RECORDS - This paragraph performs the BUILD-SORTKEY paragraph which builds the sortkey. The sortkey is added to the type 0 record and the type 1 record. The records are then given to sort.

- OUTPUT-SORT-RECORDS-A - This paragraph builds the sortkey and adds it to each type 2 record. The record is then given to sort.

- OUTPUT-RECORDS - This paragraph writes the type 0 and type 1 record on the answer data set.

- OUTPUT-RECORDS-A - This paragraph writes each type 2 record on the answer data set.

- GET-LOGICAL-RECORD - This paragraph is the high level control for reading a logical record. It performs the LGL-RECORD paragraph until the logical record is complete.

- LGL-RECORD - This paragraph passes control to one of the following six paragraphs depending on what was selected from the sequencing control matrix.

- PROCESS-ERROR - This paragraph is entered when a file sequencing error was detected. It issues an error message and terminates the run.

- PROCESS-TYPE0 - This paragraph is entered when a type 0 record was read. It moves the record to the NRC0 area.

- PROCESS-TYPE1 - This paragraph is entered when a type 1 record was read. It moves the record to the WRC1 area and NRC1 area.

- PROCESS-TYPE2 - This paragraph is entered when a type 2 record was read. It moves the record to the WRC2 area.

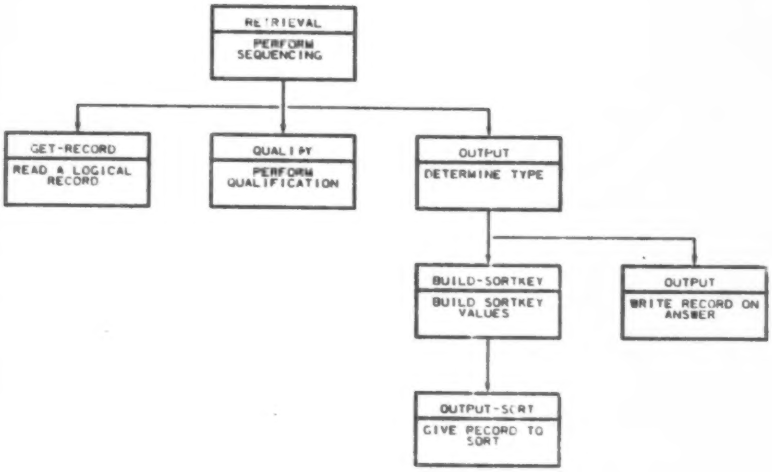
- LOGICAL-RECORD-COMPLETE - This paragraph is entered when the logical record is complete in working storage and contains all the data necessary for processing.

- LOGICAL-RECORD-INCOMPLETE - This paragraph is entered when the logical record is complete in working storage but does not contain the necessary data for processing.

- QUALIFICATION - This paragraph contains the retrieval qualification specification stated by the user. Its contents vary.

- BUILD-SORTKEY - This paragraph contains the sort specification stated by the user. Its contents vary.

Figure 3.2.2-2 illustrates the organization of the Retriever routines.


RETRIEVAL
PERFORM SEQUENCING
GET-RECORD
READ A LOGICAL RECORD
QUALIFY
PERFORM QUALIFICATION
OUTPUT
DETERMINE TYPE
BUILD-SORTKEY
BUILD SORTKEY VALUES
OUTPUT
WRITE RECORD ON ANSWER
OUTPUT-SORT
GIVE RECORD TO SORT

Retriever Routine RETRIEVAL
Figure 3.2.2-2

## 4.0 OUTPUT PROGRAMS

There are five output programs in the EIS system, each producing a different form of output. These five are the File List, Summary Report, NEDS Point Source, NEDS Area Source, and NEDS Area Source Report output programs.

## 4.1 FILE LIST OUTPUT

The File List program produces a detail listing of the EIS master file and the EIS retrieval answer files. The files will be listed with one point source record per page. If a single plant has more than one point the plant information is repeated for each point source page.

### 4.1.1 ORGANIZATION

The File List program is organized in a top down modular structure. There is one main module where the program is entered and left. This main module executes six subordinate modules. The program contains six other modules which are subroutines used by all other modules.

- ROOT-SEGMENT

  This is the highest level module in the program. This module opens all of the files used in the program, and then initializes the Master File work area. It then executes the main program loop until all master records have been read and printed. After the last line has been printed, the master record count line is printed as an indication that all records have been printed.

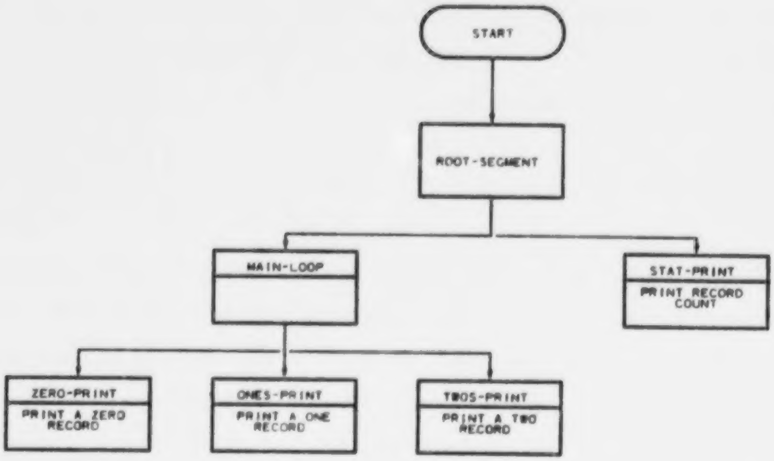
- MAIN-LOOP

  This routine is performed by the ROOT-SEGMENT until the end of file on the master file is reached. This routine determines the record type and performs the appropriate subroutine to print that record type.

- STAT-PRINT

  This routine formats and prints the master record count line at the end of the program.

Figure 4.1-1 illustrates the organization of the File List component.


START
ROOT-SEGMENT
MAIN-LOOP
STAT-PRINT
PRINT RECORD COUNT
ZERO-PRINT
PRINT A ZERO RECORD
ONES-PRINT
PRINT A ONE RECORD
TWOS-PRINT
PRINT A TWO RECORD

File List Organization
Figure 4.1-1

### 4.1.2 COMMUNICATION AND DATA FORMATS

The following COBOL WORKING-STORAGE fields are the major control flags internal to File List.

- ZERO-PRINT-SWITCH - Used by the MAIN-LOOP subroutine to determine if a zero record has been printed for the current one record (ZERO-PRINT-SWTICH= 1) or if the zero record has yet to be printed (ZERO-PRINT-SWITCH= 0).

- EOF-SWITCH - Used by the ROOT-SEGMENT to determine if any of the subroutines have read the last record on the master file (EOF-SWITCH= 1).

### 4.1.3 ROUTINES

There are no major subroutines in this program.

## 4.2 SUMMARY REPORT OUTPUT

This program will produce a summary based on control breaks specified by the user. It accumulates number of sources, estimated emissions, actual emissions, allowable emissions and control costs. The data must be sorted in the order of the specified control breaks. One of the control breaks must be pollution ID to produce a meaningful report.

The Emissions Summary program utilizes the Report Writer feature of COBOL. Therefore, the remaining portion of the program consists of routines which prepare the data and "drive" the Report Writer.

### 4.2.1 ORGANIZATION

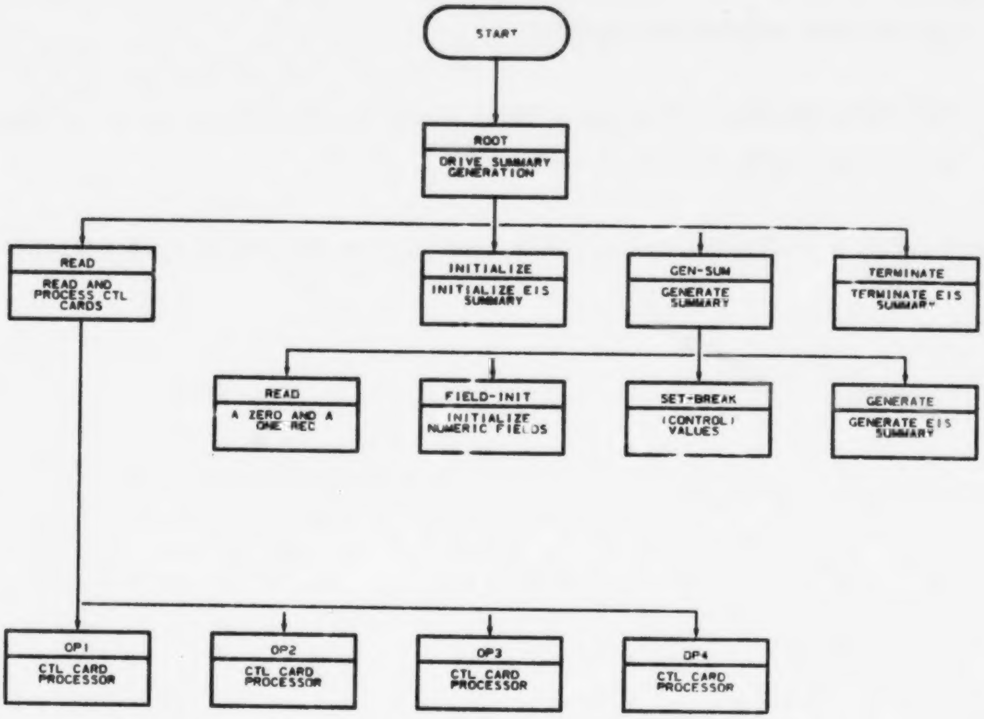
The report summary capability consists of the following routines:

- ROOT-SEGMENT - This is the highest level routine. It opens and closes data sets, initiates and terminates the COBOL Report Writer and controls processing of the summary report.
- CTL-READ-INIT - This is a second level routine which controls the reading and initialization of the summary header control cards.
- CTL-CARD-LOOP - This is a third level routine which reads control cards and controls processing of the control cards.
- CTL-CARD-OP1 - This is a fourth level routine which processes the "OP1" control card.
- CTL-CARD-OP2 - This is a fourth level routine which processes the "OP2" control card.
- CTL-CARD-OP3 - This is a fourth level routine which processes the "OP3" control card.
- CTL-CARD-OP4 - This is a fourth level routine which processes the "OP4" control card.
- GEN-SUM-REPORT - This is a second level routine which controls reading of the EIS file data and preparation of that data. It also "drives" the portion of the Report Writer which generates the summary.
- READ-ZERO-ONE-REC - This is a third level routine which reads an EIS file record and moves it to working storage.

- FIELD-INIT - This is a third level routine which assures that all accumulated values are numeric.

- SET-BREAK-VALUES - This is a third level routine which sets the user specified break control values.

Figure 4.2-1 illustrates the organization of the Summary Output component.


START
ROOT
DRIVE SUMMARY GENERATION
READ
READ AND PROCESS CTL CARDS
INITIALIZE
INITIALIZE EIS SUMMARY
GEN-SUM
GENERATE SUMMARY
TERMINATE
TERMINATE EIS SUMMARY
READ
A ZERO AND A ONE REC
FIELD-INIT
INITIALIZE NUMERIC FIELDS
SET-BREAK
(CONTROL) VALUES
GENERATE
GENERATE EIS SUMMARY
OP1
CTL CARD PROCESSOR
OP2
CTL CARD PROCESSOR
OP3
CTL CARD PROCESSOR
OP4
CTL CARD PROCESSOR

Summary Report Organization
Figure 4.2-1

### 4.2.2 COMMUNICATION AND DATA FORMATS

The summary program uses the following data sets:

- EISFILE - This is an input data set and contains the sorted answer file.
- SUMCARDS - This is an input data set and contains the summary header control cards.
- CARDLOG - This is an output data set for logging the summary header control cards.
- SUMFILE - This is an output data set for the summary report.

The summary program uses the following data/communication array:

- OLD-CONTROL - This array resides in the file section and defines the EIS record key.
- OLD-MAST0 - This array resides in the file section and defines the EIS zero segment.
- OLD-MAST1 - This array resides in the file section and defines the EIS one segment.
- OLD-MAST2 - This array resides in the file section and defines the EIS two segment.
- BREAK-ONE - Lowest level control value in working storage.
  BREAK-TWO - Second lowest level control value in working storage.
  BREAK-THREE - Third lowest level control value in working storage.

BREAK-FOUR - Fourth lowest level control value in working storage.
BREAK-FIVE - Highest level control value in working storage.

- CTL-CRD-ONE - This array resides in working storage and describes control card one.

- CTL-CRD-TWO - This array resides in working storage and describes control card two.

- CTL-CRD-THREE - This array resides in working storage and describes control card three.

- CTL-CRD-FOUR - This array resides in working storage and describes control card four.

- EMT-SET-INDEX - This data name must be used as a subscript when referring to any data item in the repeating portion of the record. For example, if Primary Control Equipment is to be the second control break, the statement would be written - MOVE MSTR-PRIMARY (EM-SET-INDEX) TO BREAK-TWO.

- MSTR-FIXED-SEGMENT - This array resides in working storage and describes the EIS zero record.

- MSTR-POINT-SOURCE - This array resides in working storage and describes the EIS one record.

- SUM-BUCKETS - This array resides in working storage. It defines temporary storage for values being accumulated.

### 4.2.3 ROUTINES

- COBOL Report Writer

  The COBOL Report Writer section has seven control fields. These are in order of level (high to low):

  1 - Final
  2 - Control-Separate
  3 - Break-Five
  4 - Break-Four
  5 - Break-Three
  6 - Break-Two
  7 - Break-One

It has a page heading and a page footing. There is a detail line, without output, to trigger the summary accumulation. There is a heading control on CONTROL-SEPARATE which can be used to create a separation line (should only be used when all five breaks are specified). There are control footings for each break.

## 4.3 NEDS POINT SOURCE OUTPUT

The NEDS point source output program produces NEDS point source records from the records in an EIS file. The EIS records are converted as follows: the type 0 record produces an AP1 record; the type 1 record produces AP2, AP3, AP4 and AP5 records; and each type 2 record produces an AP6 record. If a single plant (type 0 record) has more than one point source (type 1 record), the AP1 record is repeated for each new type 1 record.

### 4.3.1 ORGANIZATION

The NEDS point source output program is organized in a top down, modular structure. There is only one entrance and one exit from the program, both contained in the highest level module. Each lower level module invoked has the same characteristics: one entrance and one exit.

- ROOT-SEGMENT

  This is the highest level module in the program. As such, it controls the execution of all modules subordinate to it. The first routine performed by ROOT-SEGMENT opens all files used by the program and initializes all switches. The second routine is the main processing loop and is executed until all EIS records have been converted to NEDS records and output. The final routine performed by ROOT-SEGMENT prints a termination record and closes all files.

- MAIN-LOOP

  This routine is performed by ROOT-SEGMENT until an end of file is detected on the EIS file. It determines the record type and invokes the appropriate conversion routine. If the record type is invalid, a diagnostic message is printed and processing continues with the next EIS record.

- ZERO-RECORD-CONVERSION

  This routine initializes all NEDS records to blanks and saves the key portion of the type 0 EIS record. It then converts the EIS record to a NEDS AP1 and outputs it.

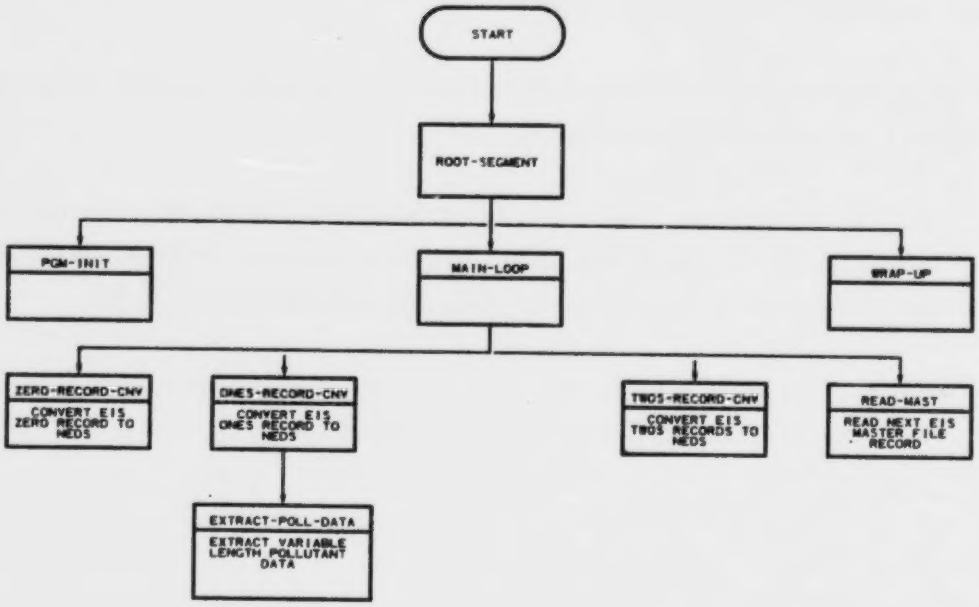
- ONES-RECORD-CONVERSION

  If the NEDS AP1 record has yet to be written (i.e., this is not the first type 1 EIS record with this key), this routine will write the previously created NEDS AP1 record and then proceed to convert the EIS type 1 record. A routine named EXTRACT-POLLUTANT-DATA is invoked to extract variable length pollutant data from the type 1 record. After the NEDS AP2, AP3, AP4 and AP5 records are built, they are output.

- TWOS-RECORD-CONVERSION

  This routine converts the EIS type 2 record to a NEDS AP6 record and outputs it.

Figure 4.3-1 illustrates the organization of the NEDS Point Source Output component.


START
ROOT-SEGMENT
PGM-INIT
MAIN-LOOP
WRAP-UP
ZERO-RECORD-CNV
CONVERT EIS ZERO RECORD TO NEDS
ONES-RECORD-CNV
CONVERT EIS ONES RECORD TO NEDS
TWOS-RECORD-CNV
CONVERT EIS TWOS RECORDS TO NEDS
READ-MAST
READ NEXT EIS MASTER FILE RECORD
EXTRACT-POLL-DATA
EXTRACT VARIABLE LENGTH POLLUTANT DATA

NEDS Point Source Output Organization
Figure 4.3-1

### 4.3.2 COMMUNICATION AND DATA FORMATS

The following COBOL WORKING-STORAGE fields are the major control flags internal to NEDS point source output program.

- NEDS-01-WRITTEN-SW - Used by the ONES-RECORD-CONVERSION routine to determine if the NEDS AP1 record has been written (NEDS-01-WRITTEN-SW = 1) or if it has to be written (NEDS-01-WRITTEN-SW = 0).

- END-OF-FILE-SW - Used by the ROOT-SEGMENT to determine when all records from the EIS file have been written (END-OF-FILE-SW = 1).

### 4.3.3 ROUTINES

There are no major subroutines in this program.

## 4.4 NEDS AREA SOURCE OUTPUT

This program will produce NEDS format Area Source Records from EIS Area Source data. The program expects only Area Source data. Therefore, if both Point and Area Source data is contained in the EIS file, the Area Source records must be retrieved before execution of this capability. This program can be better understood if one is familiar with the process of converting from NEDS Area Source to EIS format (section 5.2).

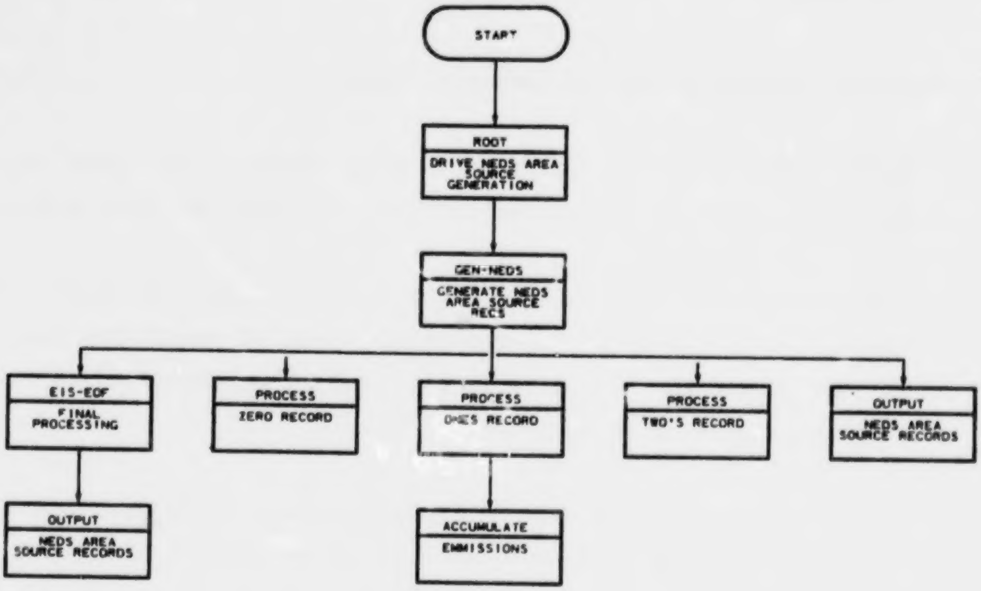
NEDS Area Source Records are generated by creating a set of records from a logical EIS record. This is done by accumulating the estimated emissions and moving the values from the EIS record to the NEDS record. When all values have been set in the NEDS records, the entire set is output.

### 4.4.1 ORGANIZATION

The program consists of the following routines:

- ROOT-SEGMENT - This is the highest level routine. It opens and closes files and controls processing until all EIS data has been processed.
- GEN-NEDS-AS-RECS - This is a second level routine. It reads the EIS records and controls processing until a logical record has been processed. It then causes the NEDS records which have been generated as a result of this processing to be output.
- EIS-FILE-EOF - This is a third level routine. It is executed when the EIS end of file has been encountered. It determines whether NEDS records need to be output and causes them to be output where required.
- OUTPUT-NEDS-AREA-SOURCE - This is a third level routine. It converts the accumulated emissions to hundreds of tons. These emissions are moved to the NEDS A1 card. All NEDS cards are then logged on the printer and written on the output data set.
- PROCESS-0-REC - This is a third level routine. It initializes the NEDS record areas and the emissions accumulators.
- PROCESS-1-REC - This is a third level routine. This routine causes emissions to be accumulated for all pollutants.
- ACCUM-EMISSIONS - This is a fourth level routine. It causes emissions to be accumulated in the appropriate pollutant accumulator.
- PROCESS-2-REC - This is a third level routine. It controls execution of the routines which set the fuel/pollution source values.

Figure 4.4-1 illustrates the organization of the NEDS Area Source Output Component.


START
ROOT
DRIVE NEDS AREA SOURCE GENERATION
GEN-NEDS
GENERATE NEDS AREA SOURCE RECS
EIS-EOF
FINAL PROCESSING
PROCESS
ZERO RECORD
PROCESS
ONES RECORD
PROCESS
TWO'S RECORD
OUTPUT
NEDS AREA SOURCE RECORDS
OUTPUT
NEDS AREA SOURCE RECORDS
ACCUMULATE
EMMISSIONS

NEDS Area Source Output Organization
Figure 4.4-1

## 4.4.2 COMMUNICATION AND DATA FORMATS

The NEDS Area Source Output program uses the following data sets:

- EISFILE - This is the input data file. It may be a master file or an answer file provided that it contains only area source data records.
- NEDASFIL - This is the output file for the NEDS format Area Source records.
- NEDASLOG - This is the printer log for the NEDS format Area Source records.

The NEDS Area Source Output program uses the following data/communication arrays:

- MSTR-FIXED-SEGMENT - This data array resides in the file section and describes the format of the EIS master fixed (record 0) segment.
- MSTR-POINT-SEGMENT - This data array resides in the file section and describes the format of the EIS master point (record 1) segment.
- MSTR-MACHINE-PROCESS - This data array resides in the file section and describes the format of the EIS master machine (record 2) segment.
- CARD-STORAGE-AREA - This data array resides in the working storage section and describes the format of NEDS Area Source records A1-A5.
- AA6-CARD-OUTPUT - This data array resides in the working storage section and describes the format of NEDS Area Source record A6.
- WORK-SCC - This data array resides in the working storage section and describes the format of the SCC.

- POLL-ID-TABLE - This data array resides in the working storage section and defines the Area Source Pollutant codes.
- AS-FUEL-CODES - This data array resides in the working storage section and defines the fuel/pollutant source codes.
- SUL-ASH-CODES - This data array resides in the working storage section and defines the Sulfur/Ash codes.

### 4.4.3 ROUTINES

For each Area Source category there is a subroutine to set the fuel/pollutant source value. The PROCESS-2-REC routine controls the execution of these subroutines and of the subroutine which sets the percentages of sulfur and/or ash.

The routine consists of the following subroutines:

RES-FUEL - This subroutine sets the Residential fuel values.

COMM-AND-INST-FUEL - This subroutine sets the Commercial and Institutional Fuel values.

INDUST-FUEL - This subroutine sets the Industrial Fuel values.

ON-SITE-INCIN - This subroutine sets the On Site Incineration Pollutant values.

OPEN-BURN - This subroutine sets the Open Burning Pollutant values.

GAS-FUEL - This subroutine sets the Gasoline Fuel values.

DIES-FUEL - This subroutine sets the Diesel Fuel values.

AIR - This subroutine sets the Aircraft Pollutant values.

VES - This subroutine sets the Vessels Pollutant values.

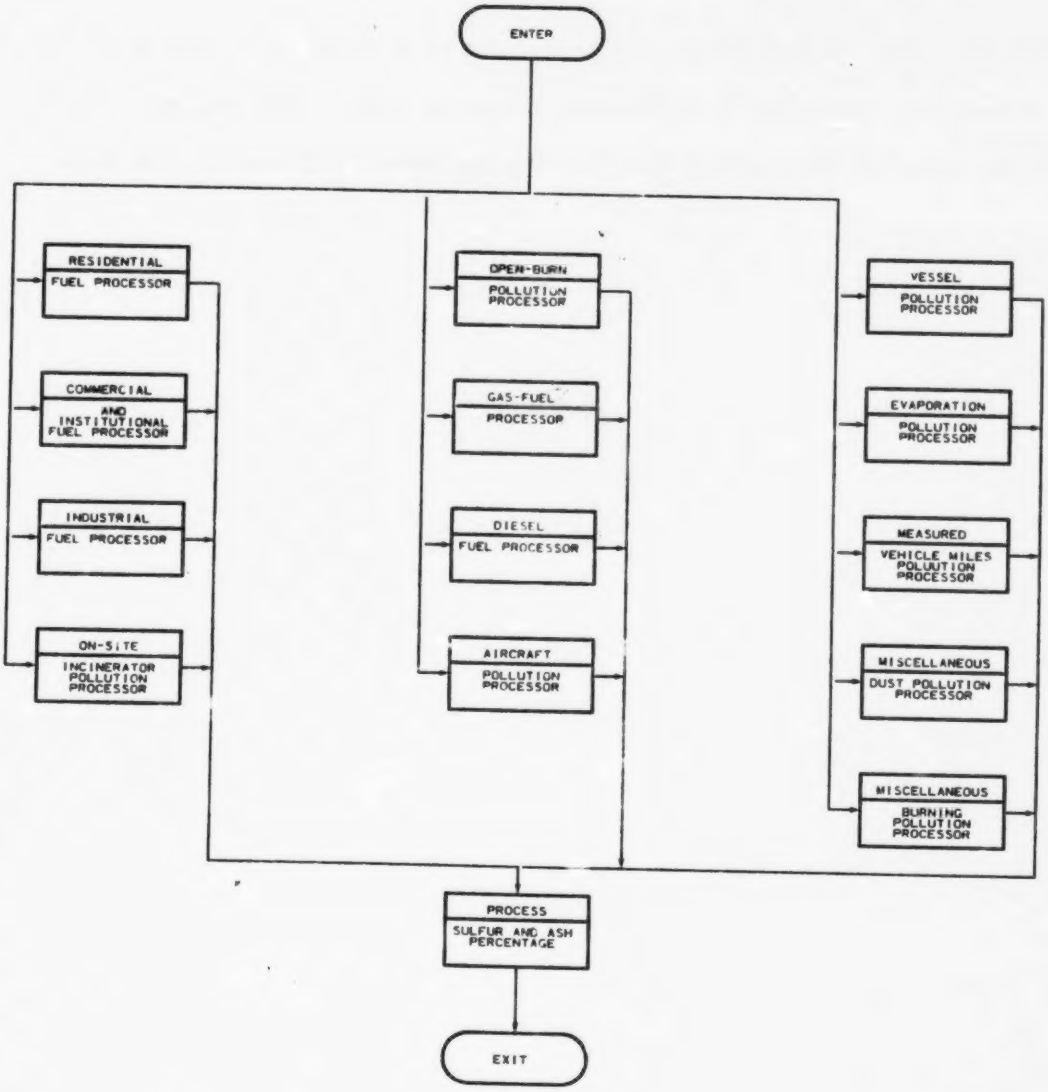
EVAPOR - This subroutine sets the Evaporation Pollutant values.

MEAS-VEH-MILE - This subroutine sets the Measured Vehicle Mile Pollutant values.

MISC-DUST - This subroutine sets the Miscellaneout Dust Pollutant values.

MISC-BURN - This subroutine sets the Miscellaneout Burning Pollutant values.

Figure 4.4-2 illustrates the organization of the NEDS Area Source Output routines.


ENTER
RESIDENTIAL
FUEL PROCESSOR
COMMERCIAL
AND INSTITUTIONAL FUEL PROCESSOR
INDUSTRIAL
FUEL PROCESSOR
ON-SITE
INCINERATOR POLLUTION PROCESSOR
OPEN-BURN
POLLUTION PROCESSOR
GAS-FUEL
PROCESSOR
DIESEL
FUEL PROCESSOR
AIRCRAFT
POLLUTION PROCESSOR
VESSEL
POLLUTION PROCESSOR
EVAPORATION
POLLUTION PROCESSOR
MEASURED
VEHICLE MILES POLLUTION PROCESSOR
MISCELLANEOUS
DUST POLLUTION PROCESSOR
MISCELLANEOUS
BURNING POLLUTION PROCESSOR
PROCESS
SULFUR AND ASH PERCENTAGE
EXIT

NEDS Area Source Output Routine PROCESS-2-REC
Figure 4.4-2

## 4.5 NEDS AREA SOURCE REPORT

The NEDS area source report program produces a formatted listing of the information contained in NEDS area source records. Each AA1 card starts a new page and the entire set (AA1 through AA6) is listed on one page.

## 4.5.1 ORGANIZATION

The NEDS area source report program is organized in a top down, modular structure. There is only one entrance and one exit from the program, both contained in the highest level module. Each lower level module invoked has the same characteristics: one entrance and one exit.

- ROOT-SEGMENT

  This is the highest level mdoule in the program. As such, it controls the execution of all modules subordinate to it. The first routine performed by ROOT-SEGMENT opens all files used by the program and initializes all switches. The second routine is the main processing loop and is executed until all NEDS records have been formatted and listed. The final routine performed by ROOT-SEGMENT prints a termination message and closes all files.

- MAIN-LOOP

  This routine is performed by ROOT-SEGMENT until and end of file is detected on the NEDS file. The NEDS record is edited and, if no severe errors are found, formatted and listed.

- EDIT-ROUTINE

  This routine edits each of the six different types of NEDS records. A diagnostic message is issued for each error found. If invalid data on the NEDS cards is encountered, the record is rejected.

- GENERATE-REPORT

  This routine formats and lists all NEDS records passed by the EDIT-ROUTINE.

Figure 4.5-1 illustrates the organization of the NEDS Area Source Report component.

### 4.5.2 COMMUNICATION AND DATA FORMATS

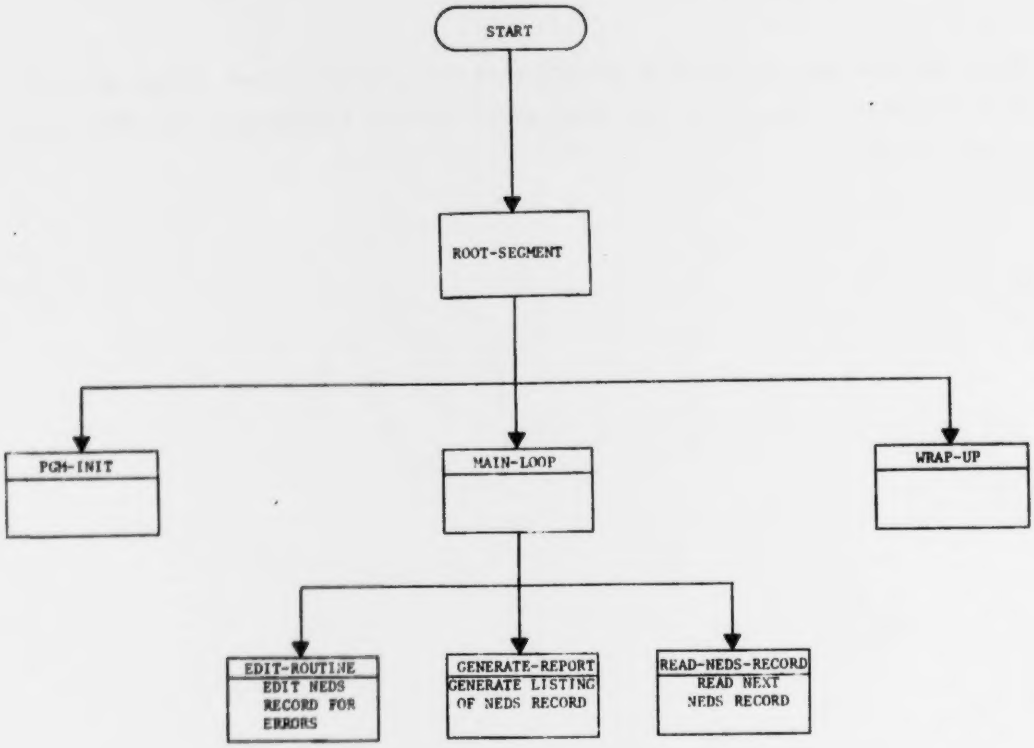
The following COBOL WORKING-STORAGE fields are the major control flags internal to the NEDS area source report program.

- ERROR-FOUND-SW - Used by MAIN-LOOP to determine if EDIT-ROUTINE has detected any serious errors in the NEDS record (ERROR-FOUND-SW = 1).

- END-OF-FILE-SW - Used by ROOT-SEGMENT to determine when all NEDS records have been processed (END-OF-FILE-SW = 1).

### 4.5.3 ROUTINES

There are no major subroutines in this program.


START
ROOT-SEGMENT
PGM-INIT
MAIN-LOOP
WRAP-UP
EDIT-ROUTINE
EDIT NEDS RECORD FOR ERRORS
GENERATE-REPORT
GENERATE LISTING OF NEDS RECORD
READ-NEDS-RECORD
READ NEXT NEDS RECORD

NEDS Area Source Report Organization
Figure 4.5-1

## 5.0 CONVERSION PROGRAMS

There are two EIS conversion programs which convert other types of data to EIS format. These are the NEDS Point Source to EIS and the NEDS Area Source to EIS.

### 5.1 NEDS POINT SOURCE TO EIS CONVERSION

This Program converts NEDS Point Source Input Data to the emission inventory transaction record format. All input cards not containing the Point Source Code and Point Source Input card numbers ranging from one (1) to six (6) are rejected and listed as invalid.

### 5.1.1 ORGANIZATION

The NEDS point source to EIS conversion program is organized in a top down, modular structure. There is only one entrance and one exit from the program, both contained in the highest level module. Each lower level module invoked has the same characteristics: one entrance and one exit.

- ROOT-SEGMENT

  This is the highest level module in the program. As such, it controls the execution of all modules subordinate to it. The first routine performed by ROOT-SEGMENT opens all files used by the program and initializes all switches. The second routine is the main processing loop and is executed until all NEDS records have been converted to EIS transactions and output. The final routine performed by ROOT-SEGMENT prints execution statistics and closes all files.

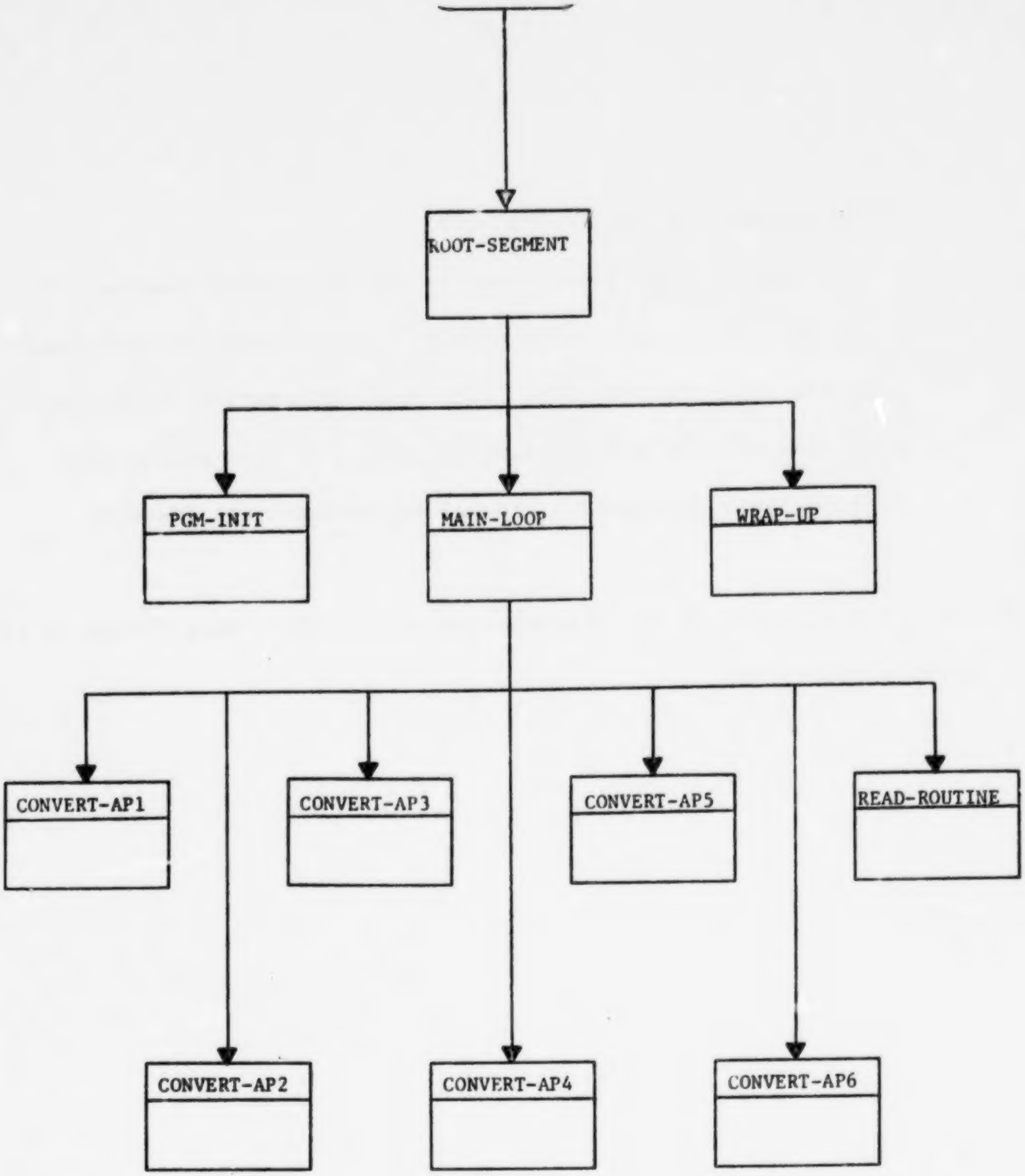
- MAIN-LOOP

  This routine is performed by ROOT-SEGMENT until an end of file is detected on the NEDS file. It determines the record type and invokes the appropriate conversion routine. If the record type is invalid, a diagnostic message is printed and processing continues with the next EIS record.

- CONVERT-AP1 through CONVERT-AP6

  Each type of NEDS record has its own conversion routine. In general, these routines accumulate the information contained in the NEDS records until sufficient information is available to generate the EIS transaction sets. At that point, the appropriate transaction generation routines are invoked.

Figure 5.1-1 illustrates the organization of the NEDS Point Source to EIS conversion component.


ROOT-SEGMENT
PGM-INIT
MAIN-LOOP
WRAP-UP
CONVERT-AP1
CONVERT-AP3
CONVERT-AP5
READ-ROUTINE
CONVERT-AP2
CONVERT-AP4
CONVERT-AP6

NEDS Point Source to EIS
Figure 5.1-1

## 5.1.2 COMMUNICATION AND DATA FORMATS

The following COBOL WORKING-STORAGE fields are the major control flags internal to the NEDS point source to EIS conversion program.

- END-OF-FILE-SW - Used by the ROOT-SEGMENT to determine when all records from the NEDS file have been written (END-OF-FILE-SW = 1).
- GEN-1-SET-SW - Used primarily by the conversion routines to determine when sufficient information has been accumulated to allow the generation of the EIS transaction sets (GEN-1-SET-SW = 1).
- CARD-13-WRITTEN-SW - Used by the EIS transaction set 1 generation routine to determine whether the pollution data extraction routine has generated any 13 transactions. If it has not, a dummy 13 transaction is written to the output file (GEN-13-WRITTEN-SW = 0).

### 5.1.3 ROUTINES

The following are major subroutines of the NEDS point source to EIS conversion program.

- EXTRACT-POLLUTANT-DATA

  This routine extracts any information present relating to each of the five pollutants contained in NEDS and places it in EIS 13 transactions. If no information is present on any of the pollutants, no 13 transactions are written by this routine.

- GENERATE-0-set

  This routine generates the EIS set 0 transactions from the information contained in the AP1 card.

- GENERATE-1-SET

  This routine generates the EIS set 1 transactions from the information contained in the AP2 through AP5 cards.

- GENERATE-2-SET

  This routine generates the EIS set 2 transactions from the information contained in the AP6 card.

## 5.2 NEDS AREA SOURCE TO EIS CONVERSION

This program will accept NEDS Area Source input records and will generate EIS format records which can be processed by the EIS File Maintenance Program. The program works only with a full set of NEDS records, i.e., A1, A2, A3, A4 and A5 records. The A6 record is read, but not processed by the program.

An area is divided into thirteen categories (a category can be equated to a pollutant source). These categories and the associated fuels or pollutant sources are identified in Table 5.2-1. This becomes the basis for the Area Source conversion, i.e., on this basis, EIS format records are generated which describe the area and provide information which can be used by EIS File Maintenance to calculate estimated emissions by pollutant. The contents of the EIS transaction records are described in Table 5.2-2.

| Category | EIS ID (USER-POINT-ID) | Fuel/Pollutant Source | (AREA) SCC |
|---|---|---|---|
| Residential Fuel | 901 | Anthracite Coal | 90100111 |
| | | Bituminous Coal | 90100222 |
| | | Distillate Oil | 90100330 |
| | | Residual Oil | 90100440 |
| | | Natural Gas | 90100500 |
| | | Wood | 90100600 |
| Commercial and Institutional Fuel | 902 | Anthracite Coal | 90200111 |
| | | Bituminous Coal | 90200222 |
| | | Distillate Oil | 90200330 |
| | | Residual Oil | 90200440 |
| | | Natural Gas | 90200500 |
| | | Wood | 90200600 |
| Industrial Fuel | 903 | Anthracite Coal | 90300111 |
| | | Bituminous Coal | 90300222 |
| | | Coke | 90300700 |
| | | Distillate Oil | 90300330 |
| | | Residual Oil | 90300440 |
| | | Natural Gas | 90300500 |
| | | Wood | 90300600 |
| | | Process Gas | 90300800 |
| On Site Incineration | 904 | Residential | 90401100 |
| | | Industrial | 90401200 |
| | | Commercial/Institutional | 90401300 |
| Open Burning | 905 | Residential | 90501100 |
| | | Industrial | 90501200 |
| | | Commercial/Institutional | 90501300 |
| Gasoline Fuel | 906 | Light Vehicle | 90602100 |
| | | Heavy Vehicle | 90602200 |
| | | Off Hiway | 90602300 |
| Diesel Fuel | 907 | Heavy Vehicle | 90702200 |
| | | Off Hiway | 90702300 |
| | | Rail Locomotive | 90702400 |

AREA SOURCE CATEGORIES
Table 5.2-1

| Category | EIS ID (USER-POINT-ID) | Fuel/Pollutant Source | (AREA) SCC |
|---|---|---|---|
| Aircraft | 908 | Military | 90803100 |
| | | Civil | 90803200 |
| | | Commercial | 90803300 |
| Vessels | 909 | Anthracite Coal | 90900111 |
| | | Diesel Oil | 90904230 |
| | | Residual Oil | 90900440 |
| | | Gasoline | 90904430 |
| Evaporation | 910 | Solvent Purchased | 91005100 |
| | | Gasoline Marketed | 91005200 |
| Measured Vehicle Miles | 911 | Limited Access Roads | 91106100 |
| | | Rural Roads | 91106200 |
| | | Suburban Roads | 91106300 |
| | | Urban Roads | 91106400 |
| Miscellaneous Dust | 912 | Dirt Roads Traveled | 91207100 |
| | | Dirt Air Strips | 91207200 |
| | | Construction Land Area | 91207300 |
| | | Rock Handling & Storing | 91207400 |
| Miscellaneous Burning | 913 | Forest Fires | 91308100 |
| | | Slash Burning | 91308200 |
| | | Frost Control | 91308300 |
| | | Structure Fires | 91308400 |
| | | Coal Refuse Burning | 91308500 |

AREA SOURCE CATEGORIES
Table 5.2-1
(continued)

**CARD 01:**

| **FIELD** | **CONTENTS** |
|---|---|
| State | NEDS State |
| County | NEDS County |
| AQCR | NEDS AQCR |
| Plant ID | 9999 |
| Date of Record | NEDS Year of Record-Day 000 |
| User Plant ID | AREA SOURCE |
| Own | NEDS Density |
| Action | NEDS Action |
| Card Number | 01 |
| All Other Fields | Blanks |

**CARD 02:**

| **FIELD** | **CONTENTS** |
|---|---|
| State through Date of Record | Same as Card 01 |
| Number of Employees | NEDS County Population |
| Action | NEDS Action |
| Card Number | 02 |
| All Other Fields | Blanks |

**CARD 03:**

| **FIELD** | **CONTENTS** |
|---|---|
| State through Date of Record | Same as Card 01 |
| Action | NEDS Action |
| Card Number | 03 |
| All Other Fields | Blanks |

EIS AREA SOURCE RECORDS
Table 5.2-2

**CARD 11:**

| FIELD | CONTENTS |
|---|---|
| State through Date of Record | Same as Card 01 |
| Set ID | Emission Source Count Internally Generated |
| Point ID - NEDS | 99 |
| Point ID-User | Category Code |
| SIC | 9999 |
| IPP | 99 |
| Action | NEDS Action |
| Card Number | 11 |
| All Other Fields | Blank |

**CARD 12:**

| FIELD | CONTENTS |
|---|---|
| State through Set ID | Same as Card 11 |
| Action | NEDS Action |
| Card Number | 12 |
| All Other Fields | Blanks |

**CARD 13:**

| FIELD | CONTENTS |
|---|---|
| State through Set ID | Same as Card 11 |
| Pollutant ID | Pollutant ID Cod<br>Particulates - 11101<br>SO2 - 42401<br>NOX - 42602<br>HC - 43101<br>CO - 42101 |
| Estimate Control Efficiency | 000 |
| Estimation Method | 3 |
| Action | NEDS Action |
| Card Number | 13 |
| All Other Fields | Blanks |

EIS AREA SOURCE RECORDS
Table 5.2-2 (cont.)

## CARD 21:

| FIELD | CONTENTS |
|---|---|
| State through segment 1 ID | Same as Card 11 |
| Segment 2 ID | Internally Generated Segment Count |
| SCC | |
| Fuel, Process, Solid Waste | NEDS Fuel/Pollution times Heat Content if not zero |
| Percent Sulfur | NEDS Percent Sulfur |
| Percent Ash | NEDS Percent Ash |
| Heat Content | Zero or NEDS quantity (Forest fires, slash burning, frost control and coal refuse burning) |
| Action | NEDS Action |
| Card Number | 21 |
| All Other Fields | Blanks |

## CARD 22:

| FIELD | CONTENTS |
|---|---|
| State through Segment 2 ID | Same as Card 21 |
| Action | NEDS Action |
| Card Number | 22 |
| All Other Fields | Blanks |

## CARD 23:

| FIELD | CONTENTS |
|---|---|
| State through Segment 2 ID | Same as Card 21 |
| Action | NEDS Action |
| Card Number | 23 |
| All Other Fields | Blanks |

EIS AREA SOURCE RECORDS
Table 5.2-2 (cont.)

A single set of NEDS Area Source records can cause many EIS transaction records to be generated. A set of EIS "ones" records are generated for each category having at least one fuel value. This includes five 13 records, i.e., one for each of the five pollutants. Then for each set of "ones" records, a set of "two"records is generated for each fuel value within that category.

### 5.2.1 ORGANIZATION

The program consists of the following routines:

- ROOT-SEGMENT - This is the highest level routine. It performs the file open and close functions and controls performance of the other routines, i.e., the second level conversion routine is performed until the NEDS Area Source input has been exhausted.

- CONVERT-NEDS-AREA-DATA - This is a second level routine which controls reading of an Area Source set of records and the generation of EIS transactions when a complete set has been read.

- READ-A-NEDS-CARD - This is a fourth level routine which reads a NEDS Area record, logs it on the printer, moves the record into working storage and sets the appropriate indicator.

- GEN-EIS-TRANS - This is a third level routine which initializes the output records and controls processing of the zero, one and two EIS records.

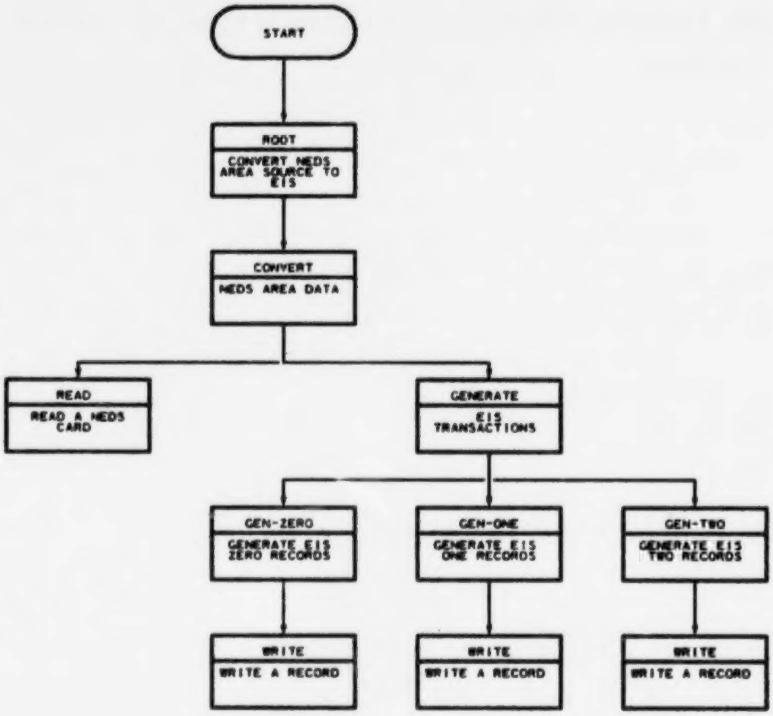
- GEN-ZERO-RECS - This is a fourth level routine which sets all values for the EIS 01, 02 and 03 cards. It also causes the records to be output.

- GEN-ONE-RECS - This is a fourth level routine which sets all values for the EIS 11, 12 and 13 records. Note 13 records are produced for each of the five pollutants. Each record generated is caused to be written.

- GEN-TWO-RECS - This is a fourth level routine which sets all values for the EIS 21, 22 and 23 records. Each record generated is caused to be written.

- WRITE-ROUTINE - This is the lowest level routine. It logs the EIS record on the printer and writes it to be processed in the next File Maintenance step.

Figure 5.2-1 illustrates the organization of the NEDS Area Source to EIS component.


START
ROOT
CONVERT NEDS AREA SOURCE TO EIS
CONVERT
NEDS AREA DATA
READ
READ A NEDS CARD
GENERATE
EIS TRANSACTIONS
GEN-ZERO
GENERATE EIS ZERO RECORDS
GEN-ONE
GENERATE EIS ONE RECORDS
GEN-TWO
GENERATE EIS TWO RECORDS
WRITE
WRITE A RECORD
WRITE
WRITE A RECORD
WRITE
WRITE A RECORD

NEDS Area Source to EIS Organization
Figure 5.2-1

### 5.2.2 COMMUNICATION AND DATA FORMATS

The NEDS Area Source to EIS Conversion program uses the following data sets:

- NEDSFILE - This is the input file which contains the NEDS format Area Source records.
- EISATRAN - This is the output file for the EIS format area source records.
- EISAERRS - This is the output file for logging input and output records.

The NEDS Area Source to EIS Conversion program uses the following communication/data arrays:

- CARD-STORAGE-AREA - This is a working storage area. It is used for storage of and describes the format of the NEDS Area Source records.
- TRANS-NN - This is a working storage area. It is used for storage of and describes the format of the EIS records.
- AREA-INDICATORS - This array resides in working storage. The indicators are used to designate presence of a NEDS Area Source record. There is one indicator per NEDS record (5). Zero indicates no record present. One indicates a record present.
- SET-REC-KEY-BUC - This is a working area for building a record key.
- PROCESS-TABLE - This is a Table of SCC's. There is a one to one relationship between the entries in this table and the fuel/pollutant values in the NEDS Area Source records. The table is most critical to the

conversion program. Though the codes were arbitrarily generated, they have significance as follows:

SCC Format AAABBBCD

A - Corresponds to the category code (see Table 5.2-1)

B - Fuel/Pollution Source Code as follows:

| Code | Fuel |
|---|---|
| 001 | Anthracite Coal |
| 002 | Bituminous Coal |
| 003 | Distillate Oil |
| 004 | Residual Oil |
| 005 | Natural Gas |
| 006 | Wood |
| 007 | Coke |
| 008 | Process Gas |
| 011 | Residential |
| 012 | Industrial |
| 013 | Commercial/Institutional |
| 021 | Light Vehicle |
| 022 | Heavy Vehicle |

| Code | Fuel |
|---|---|
| 023 | Off Hiway |
| 024 | Rail Locomotive |
| 031 | Military |
| 032 | Civil |
| 033 | Commercial |
| 042 | Diesel Oil |
| 044 | Gasoline |
| 051 | Solvent Purchased |
| 052 | Gasoline Marketed |
| 061 | Limited Access Roads |
| 062 | Rural Roads |
| 063 | Suburban Roads |
| 064 | Urban Roads |
| 071 | Dirt Roads Traveled |
| 072 | Dirt Air Strips |
| 073 | Construction Land Area |
| 074 | Rock Handling & Storing |
| 081 | Forest Fires |
| 082 | Slash Burning |
| 083 | Frost Control |
| 084 | Structure Fires |
| 085 | Coal Refuse Burning |

C - Sulfur Code as follows:

| Code | Fuel |
|---|---|
| 0 | No Sulfur |
| 1 | Use % Anthracite Coal |
| 2 | Use % Bitumous Coal |
| 3 | Use % Distillate Oil |
| 4 | Use % Residual Oil |

D - Ash Code as follows:

| Code | Fuel |
|---|---|
| 0 | No Ash |
| 1 | Use % Anthracite Coal |
| 2 | Use % Bitumous Coal |

### 5.2.3 ROUTINES

There are no major subroutines in this program.

## 6.0 EMISSION FACTORS PROGRAMS

There are three EIS programs to facilitate the creation, maintenance and use of the emissions factors tables. These are the Emissions Factors Table Generator, Emission Factors Transaction Generator and Emission Factors Insert programs.

## 6.1 EMISSION FACTORS TABLE GENERATOR

The Emission Factors Table Generator component creates a two page (two physical records) emission ~~factors~~ table from an input data set containing SCC numbers and emission factor values. The first page of the table, the SCC index page contains an entry for each type 1 card in the input data set. The type 1 card contains the SCC number, the effective date of the SCC and the ash and/or sulfur percentages associated with this SCC. Two additional items generated by this component are added to each SCC index entry. They are the number of emission factor values assigned to the SCC and an index pointer to their location in the emission factor value page.

The second page of the table, the emission factor value page contains an entry for each type 2 card in the input data set. The type 2 card contains the SCC number to which this emission factor value is assigned, a pollution identification number, the emission factor value and two code values, the units of measure code and the ash/sulfur indicator code.

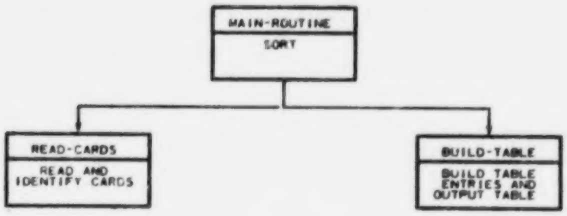
The generated table has a capacity of 800 SCC numbers and 1200 emission factor values. There may be up to 16 emission factor values for an individual SCC.

### 6.1.1 ORGANIZATION

The Emission Factors Table Generator component is organized as a control segment with two subordinate routines, the read cards routine and the build table routine. Since the control segment contains a SORT statement, linkage to the subordinate routines is accomplished internally by the SORT statement. The two subordinate routines are COBOL sections, the read cards routine is the SORT input procedure and the build table routine is the SORT output procedure.

- o CONTROL-SEGMENT - Opens the data sets required by the component and gives control to the SORT statement. The SORT statement in turn passes control to the read cards routine, performs the SORT and then passes control to the build table routine. The control segment then closes the data sets and terminates the run.
- o READ-CARDS - Reads a card from the input data set, checks the card for correct content and type and then gives the card to SORT.
- o BUILD-TABLE - Reads a card from the sorted data set, identifies it as to type and builds the appropriate table entry. When the last entry is processed the emission factors table is written on the output data set.

Figure 6.1-1 illustrates the organization of the Emission Factors Table Generator component.


MAIN-ROUTINE
SORT
READ-CARDS
READ AND IDENTIFY CARDS
BUILD-TABLE
BUILD TABLE ENTRIES AND OUTPUT TABLE

Emission Factors Table Generator Organization
Figure 6.1-1

### 6.1.2 COMMUNICATION AND DATA FORMATS

The following defines the usage of certain working storage names:

- EOFSW - May contain TRUE or FALSE. If true a data set end-of-file has been detected.
- ERRSW - May contain a TRUE or FALSE. If true an error has been detected during the read cards routine processing.
- FRDSW - May contain a TRUE or FALSE. If true the first SCC index entry is not to be moved until the number of emission factor values has been determined.
- EMFI-INDEX - Contains a count of type 1 cards read during the read cards routine and the subscript of the next SCC index entry during the build table routine.
- EMFT-INDEX - Contains a count of type 2 cards read during the read cards routine and the subscript of the next EMF table entry during the build table routine.

### 6.1.3 ROUTINES

The following subroutines are part of the READ-EMISSION-FACTORS main routine.

- READ-EMISSION-FACTORS-CARDS SECTION - This paragraph defines the beginning of the SORT input procedure section which receives control from the SORT statement. Initialization is performed and paragraph PROCESS-EMF-CARDS is performed until an end-of-file is detected on the input data set. When this occurs control is passed to EMISSION-FACTORS-CARDS-END paragraph.

- PROCESS-EMF-CARDS - This paragraph reads a card from the input data set, determines the card type and passes control to paragraph PROCESS-CARD-INVALID-ERROR, PROCESS-CARD-TYPE1 or PROCESS-CARD-TYPE2.

- PROCESS-CARD-INVALID-TYPE - This paragraph issues an error message when an invalid card is detected.

- PROCESS-CARD-TYPE1 - This paragraph processes the SCC number card. All fields of the SCC number card are checked for content and the card is then released to COBOL sort. This paragraph issues an error message for incorrect field content or when the SCC index table capacity is exceeded.

- PROCESS-CARD-TYPE2 - This paragraph processes the emission factor value card. All fields of this card are checked for content and the card is then released to COBOL sort. This paragraph issues an error message for incorrect field content or when emission factor value table capacity is exceeded.

- PROCESS-EMF-CARDS-END - This paragraph contains an EXIT statement only. Its purpose is to return control to the PROCESS-EMF-CARDS paragraph.

- ERROR-ROUTINE - This paragraph writes an error message on the list/error data set. An error flag is turned on upon entry to this paragraph.

- EMISSION-FACTORS-CARDS-END - This paragraph contains an EXIT statement only. Its purpose is to pass control back to the SORT statement when an end-of-file is detected on the input data set. It indicates to SORT that the input procedure is completed and the actual sort can be performed.

The following subroutines are part of the BUILD-EMISSION-FACTORS-TABLE main routine.

- BUILD-EMISSION-FACTORS-TABLE SECTION - This paragraph defines the beginning of the output procedure section which receives control from SORT statement after the actual sort has been performed. If an error was detected in the input procedure, the emission factors table is not constructed and the run is terminated. This paragraph performs output initialization and paragraph BUILD-TABLE-ENTRIES is performed until an end-of-file is detected on the sorted data set. When this occurs control is passed to paragraph OUTPUT-EMISSION-FACTORS-TABLE.

- BUILD-TABLE-ENTRIES - This paragraph reads a card from the sorted data set by means of the RETURN statement. The card type is determined and control is passed to either paragraph BUILD-INDEX-ENTRY or BUILD-TABLE-ENTRY.

- BUILD-INDEX-ENTRY - This paragraph converts the SCC number card field content to table format and puts the entry into the next available index entry table position.

- BUILD-TABLE-ENTRIES-END - This paragraph contains an EXIT statement only. Its purpose is to pass control back to the BUILD-TABLE-ENTRIES paragraph.

- OUTPUT-EMISSION-FACTORS-TABLE - This paragraph moves the two table pages from working storage to an output buffer and then writes the table pages on the output table data set. Paragraphs OUTPUT-INDEX-ENTRY and OUTPUT-TABLE-ENTRY are performed to list the contents of the two table pages.

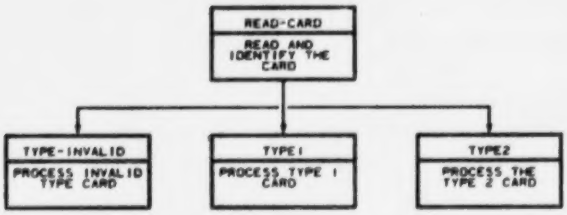
- OUTPUT-INDEX-ENTRY - This paragraph lists all the entries in the SCC index table page.

- OUTPUT-TABLE-ENTRY - This paragraph lists all the entries in the emission factor value table page.

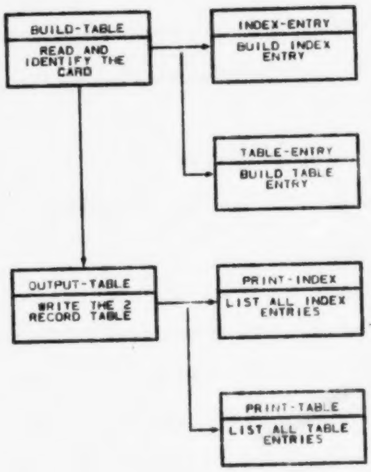
- ERROR-ROUTINE-1 - This paragraph writes an error message on the list/error data set.

- EMISSION-FACTORS-TABLE-END - This paragraph contains an EXIT statement only. Its purpose is to pass control back to the SORT statement when an end-of-file is detected on the sorted data set. It indicates to SORT that the output procedure is completed.

Figures 6.1-2 and 6.1-3 illustrate the organization of the Emission Factors Table Generator routines.


READ-CARD
READ AND IDENTIFY THE CARD
TYPE-INVALID
PROCESS INVALID TYPE CARD
TYPE1
PROCESS TYPE 1 CARD
TYPE2
PROCESS THE TYPE 2 CARD

Emission Factors Table Generator Routine
READ-EMISSION-FACTORS
Figure 6.1-2


BUILD-TABLE
READ AND IDENTIFY THE CARD
INDEX-ENTRY
BUILD INDEX ENTRY
TABLE-ENTRY
BUILD TABLE ENTRY
OUTPUT-TABLE
WRITE THE 2 RECORD TABLE
PRINT-INDEX
LIST ALL INDEX ENTRIES
PRINT-TABLE
LIST ALL TABLE ENTRIES

Emission Factors Table Generator Routine
BUILD-EMISSION-FACTORS-TABLE
Figure 6.1-3

## 6.2 EMISSION FACTORS TRANSACTION GENERATOR

The Emission Factors Transaction Generator component reads all the logical records of an existing data set and examines each type 2 record in each logical record. The SCC number in each type 2 record is the argument of an emission factors table search. If the table contains a corresponding SCC number and the date of the table SCC is equal to or greater than the user specified date, emission factor values will be inserted into this particular type 2 record. If any type 2 record in this particular logical record had emission factor values inserted, then transactions will be generated to update this logical record.

There are two forms of emission factor value insertion, an unconditional insertion (an A or X is specified by the user) or selective insertion (a T or N is specified by the user).

In the unconditional insertion mode, all emission factor values associated with the SCC number are inserted into the repetition fields of the type 2 record overlaying any existing ones. This operation may result in one or more pollution identification numbers having no corresponding entry in the repetitions of the type 1 record. In X mode, the pollution identification numbers in the type 1 record are searched to insure that all pollution identification numbers inserted in the type 2 record exist in the type 1 record. If not so, then additional entries will be added to the type 1 record repetitions. In the A mode, the type 1 record search is not performed.

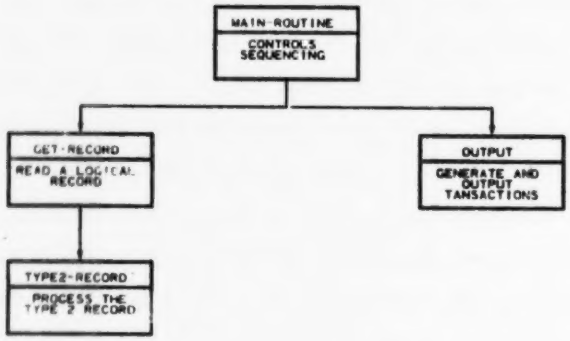
In the selective insertion mode, each pollution identification number in the type 2 record repetitions, is used to search for a corresponding pollution identification number in the set of emission factor values associated with the SCC number. If found the table emission factor value replaces the one in the record repetition. In the N mode, this operation is performed for each type 2 record. In the T mode, this operation will be performed only if the EF-SOURCE field of the type 2 record contains a T.

### 6.2.1 ORGANIZATION

The Emission Factors Transaction Generator component is organized into four routines, the main routine, the get file logical record routine, the type 2 record processing routine and the output transactions routine.

- MAIN-ROUTINE - Opens the data sets required by the component, reads the user parameter card, reads the emission factor table and processes the data file until an end-of-file is detected. In processing the file, the main routine passes control to the get file logical record routine. When control returns to the main routine an indicator ADDSW is tested. If on, control passes to the output transaction routine to generate and output the transactions. If the indicator is off, the logical record is skipped because emission factor value insertion did not occur. This process repeats until end-of-file and then the main routine closes the data sets and terminates the run.
- GET-FILE-LOGICAL-RECORD - Reads a logical record from the data file and puts it in working storage. This routine passes control to the type 2 record processing routine if a type 2 record was read and the SCC number in it exists in the emission factors table.
- TYPE-2-RECORD-PROCESSING - Performs the emission factor value insertion according to the user specified mode.
- OUTPUT-TRANSACTION - Generates EIS format transactions from the type 1 record and all its associated type 2 records of the logical record currently in working storage.

Figure 6.2-1 illustrates the organization of the Emissions Factors Transaction Generator component.


MAIN-ROUTINE
CONTROLS SEQUENCING
GET-RECORD
READ A LOGICAL RECORD
OUTPUT
GENERATE AND OUTPUT TANSACTIONS
TYPE2-RECORD
PROCESS THE TYPE 2 RECORD

Emission Factors Transaction Generator Organization
Figure 6.2-1

### 6.2.2 COMMUNICATION AND DATA FORMATS

The following defines the usage of certain working storage names:

- ADDSW - May contain TRUE or FALSE. If true emission factors were inserted into a type 2 record.
- CHGSW - May contain TRUE or FALSE. If true an entry was added to the type 1 record repetitions.
- EOFSW - May contain TRUE or FALSE. If true, a data set end-of-file has been detected.
- EXCSW - May contain TRUE or FALSE. If true, the number of entries added to the type 1 record repetitions exceeded the maximum of 16.
- FNDSW - May contain TRUE or FALSE. If true an SCC number was found in the emission factors table.
- FRDSW - May contain TRUE or FALSE. If true, the first physical record read of the get logical record is not to be performed.
- LGLSW - May contain TRUE or FALSE. If true, the logical record may be processed.
- LGLCSW - May contain TRUE or FALSE. If true, the logical record reading process is complete.
- SCCSW - May contain TRUE or FALSE. If true, the SCC number was found in the emission factors table and the SCC date test passed.
- T1RSW - May contain TRUE or FALSE. If true, the type 1 record repetition count has been initialized.

- T2RSW - May contain a T, N, A or X. Contains the user specified emission factor insertion mode of operation.

- RECORD-EXPECTED - Contains the code of the next physical record that should be read.

- RECORD-FOUND - Contains the code of the physical record that was just read.

- ROUTINE-CODE-VALUES - Contains the sequencing control matrix for the get file logical record routine. The RECORD-FOUND and RECORD-EXPECTED codes determine the $i_{ij}$ entry of the matrix. This entry contains the argument of a go to depending on statement to pass control to the various paragraphs of the get file logical record routine.

- MASTER-TYPE-0 - Contains the type 0 record.

- MASTER-TYPE-1 - Contains the type 1 record.

- MASTER-TYPE-2 - Contains a single type 2 record.

- MASTER-TYPE-2-SAVE - Contains all the type 2 records belonging to this logical record.

### 6.2.3 ROUTINES

The following subroutines are part of the MAIN-ROUTINE.

- READ-DATE-CARD - This paragraph reads the card containing the SCC date and insertion mode. A read error will terminate program operation.
- READ-EMISSION-FACTORS-TABLE - This paragraph reads the two pages of the emission factors table. A read error will terminate program operation.
- PROCESS-DATA-FILE - This paragraph performs initialization and performs paragraph PROCESS-FILE-LOGICAL-RECORD until an end-of-file is detected on the data file.
- STOP-RUN - This paragraph closes the data sets and terminates program operation.
- PROCESS-FILE-LOGICAL-RECORD - This paragraph reads a logical record from the data file and tests if any emission factor insertion was performed. If so, control passes to the output transaction routine to generate transactions.

The following subroutines are part of the GET-FILE-LOGICAL-RECORD main routine:

- GET-RECORD - This paragraph reads a physical record from the data file and sets a code in RECORD-FOUND indicating the record type.
- GET-LOGICAL-RECORD - This paragraph receives control from the control segment when a logical record is to be read. It sets LGLCSW false and performs paragraph LGL-RECORD until LGLCSW is set true.
- LGL-RECORD - This paragraph provides the control logic to read physical records and assemble them into a logical record. This paragraph performs

GET-RECORD and then one of the following five paragraphs to process the physical record just read. Paragraph GET-RECORD is not performed upon first entry since the physical record is already in the buffer. This record was read by the previous get logical record request.

- LGL-RECORD-ERROR - This paragraph is entered when a file sequencing error has been detected. It issues an error message and terminates the run.
- LGL-RECORD-TYPE0 - This paragraph is entered when a type 0 record has been read. It moves the record to working storage.
- LGL-RECORD-TYPE1 - This paragraph is entered when a type 1 record has been read. It moves the record to working storage and sets up for the type 2 record reading.
- LGL-RECORD-TYPE2 - This paragraph is entered when a type 2 record has been read. It counts the number of type 2 records read and moves the record to working storage. Paragraph SCC-SEARCH is performed to determine if the SCC number is in the emission factors table. If so, control is passed to the type 2 record processing routine to perform the specified emission factors insertion. The record is then moved to the save all type 2 records area of working storage.
- LGL-RECORD-COMPLETE - This paragraph is entered when the record just read belongs to the next logical record. The LGLCSW, LGLSW and FRDSW are set true.
- LGL-RECORD-INCOMPLETE - This paragraph is entered when an end-of-file has been detected on the data file and the logical record in working storage is incomplete. The LGLCSW is set true and LGLSW is set false.
- LGL-RECORD-END - This paragraph contains an exit statement only. Its purpose is to pass control back to the GET-LOGICAL-RECORD paragraph.

The following subroutines are part of the TYPE-2-RECORD-PROCESSING main routine:

- T2RECORD-PROCESSING - This paragraph is the control routine for the type 2 record processing. It examines the user specified mode and performs one or more of the following paragraphs.

- SCC-SEARCH - This paragraph does a binary search of the SCC index entries in the first page of the emission factors table. The SCC number from the type 2 record is used as the search argument. If found and the date check passes, the index entry is saved and the ash and/or sulfur percentage values are inserted into the corresponding fields of the type 2 record.

- POLID-SEARCH-T2RECORD - This paragraph cycles through the pollutant identification numbers in the repetitions portion of the type 2 record. This paragraph is used in conjunction with POLID-SEARCH-EMF-TABLE paragraph to determine if the pollutant identification number in the type 2 record is in the emission factors table.

- POLID-SEARCH-EMF-TABLE - This paragraph searches the emission factors table to determine if a specified pollutant identification number is in the table.

- EMISSION-FACTORS-INSERTION - This paragraph converts an emission factor value entry to the transaction form and inserts it into a specified repetition of the type 2 record.

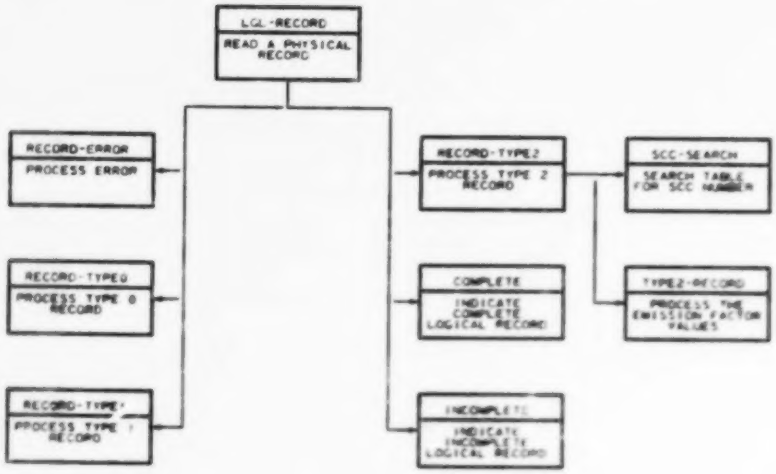
- POLID-INSERTION-T2RECORD - This paragraph replaces all existing emission factor values in the type 2 record repetitions with the emission factor values from the emission factors table.

- POLID-SEARCH-T1RECORD - This paragraph examines all the pollutant identification numbers in the type 2 record and determines if a pollutant identification entry must be created as a new type 1 record repetition.

The following subroutines are part of the OUTPUT-TRANSACTIONS main routine:

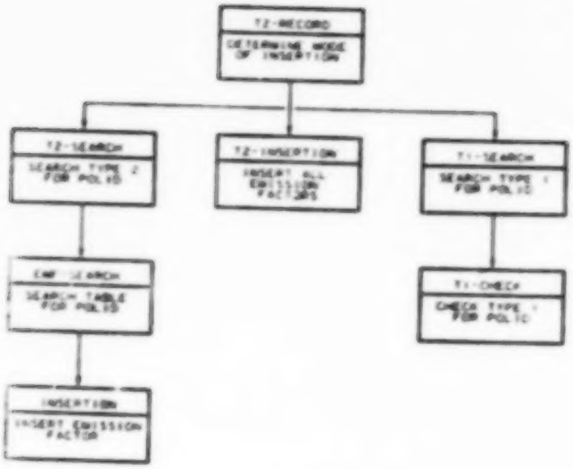
- OUTPUT-TYPE1-TRANSACTIONS - This paragraph formats and outputs the EIS 11 and 12 transactions.
- OUTPUT-TYPE13-TRANSACTIONS - This paragraph formats and outputs the EIS 13 transactions.
- OUTPUT-TYPE2-TRANSACTIONS - This paragraph formats and outputs the EIS 21 and 22 transactions.
- OUTPUT-TYPE23-TRANSACTIONS - This paragraph formats and outputs the EIS 23 transactions.

Figures 6.2-2 through 6.2-4 illustrate the organization of the Emission Factors Transaction Generator routines.


LGL-RECORD
READ A PHYSICAL RECORD
RECORD-ERROR
PROCESS ERROR
RECORD-TYPE0
PROCESS TYPE 0 RECORD
RECORD-TYPE1
PROCESS TYPE 1 RECORD
RECORD-TYPE2
PROCESS TYPE 2 RECORD
COMPLETE
INDICATE COMPLETE LOGICAL RECORD
INCOMPLETE
INDICATE INCOMPLETE LOGICAL RECORD
SCC-SEARCH
SEARCH TABLE FOR SCC NUMBER
TYPE2-RECORD
PROCESS THE EMISSION FACTOR VALUES

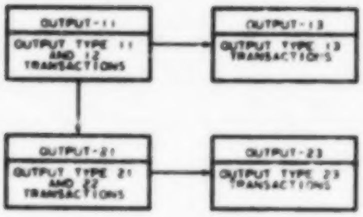
Emission Factors Transaction Generator Routine
GET-FILE-LOGICAL-RECORD

Figure 6.2-2


T2-RECORD
DETERMINE MODE OF INSERTION
T2-SEARCH
SEARCH TYPE 2 FOR POLID
T2-INSERTION
INSERT ALL EMISSION FACTORS
T1-SEARCH
SEARCH TYPE 1 FOR POLID
EMF-SEARCH
SEARCH TABLE FOR POLID
T1-CHECK
CHECK TYPE 1 FOR POLID
INSERTION
INSERT EMISSION FACTOR

Emission Factors Transaction Generator Routine
TYPE-2-RECORD-PROCESSING

Figure 6. 2-3


OUTPUT-11
OUTPUT TYPE 11 AND 12 TRANSACTIONS
OUTPUT-13
OUTPUT TYPE 13 TRANSACTIONS
OUTPUT-21
OUTPUT TYPE 21 AND 22 TRANSACTIONS
OUTPUT-23
OUTPUT TYPE 23 TRANSACTIONS

Emission Factors Transaction Generator Routine
OUTPUT-TRANSACTIONS
Figure 6.2-4

## 6.3 EMISSION FACTORS INSERT

The Emission Factors Insertion component reads an input data set containing EIS format transactions, sorts the transactions in ascending key sequence and where required inserts emission factor values into the 23 format transactions.

There are two forms of emission factor value insertion, an unconditional insertion (an A in the EF-SOURCE field) or a selective insertion (a T in the EF-SOURCE field). In the unconditional insertion mode, all emission factor values associated with the SCC number will be inserted into the output data stream, one emission factor value for each 23 transaction. In the selective insertion mode, the pollution identification number in the 23 transaction is used to search all the emission factor values associated with the SCC number. If a corresponding pollution identification number is found, its emission factor value will be inserted into the 23 transaction.

### 6.3.1 ORGANIZATION

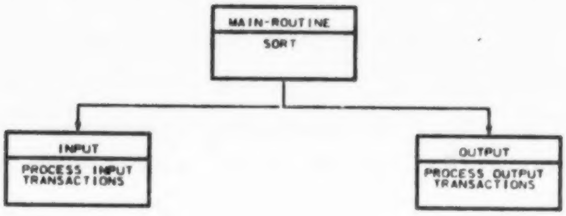
The Emission Factors Insertion component is organized as a control segment with two subordinate routines, the read transaction routine and the write transaction routine. The control segment contains a SORT statement which provides the internal linkage to the subordinate routines. The subordinate routines are COBOL sections, the read transaction routine is the SORT input procedure and the write transaction routine is the SORT output procedure.

- CONTROL-SEGMENT - Opens the data sets required by the component and gives control to the SORT statement. The SORT statement in turn passes control to the read transaction routine, performs the sort and then passes control to the write transaction routine. After all transactions have been written on the output data set, the control segment closes the data sets and terminates the run.

- READ-TRANSACTION - Reads a transaction from the input data set, assigns it a type code, extracts certain transaction fields to build the sortkey and then gives the transaction with its attached sortkey to sort.

- WRITE-TRANSACTION - Reads a transaction from the sorted data set, determines the transaction type and inserts emission factors where required.

Figure 6.3-1 illustrates the organization of the Emission Factors Insert component.


MAIN-ROUTINE
SORT
INPUT
PROCESS INPUT TRANSACTIONS
OUTPUT
PROCESS OUTPUT TRANSACTIONS

Emission Factors Insert Organization
Figure 6.3-1

### 6.3.2 COMMUNICATION AND DATA FORMATS

The following defines the usage of certain working storage names:

- EOFSW - May contain TRUE or FALSE. If true, a data set end-of-file has been detected.
- FNDSW - May contain TRUE or FALSE. If true the SCC number was found in the emission factors table.
- WORK-RECORD-KEY - Contains the key from the type 21 transaction. Subsequent 22 and 23 transactions must have the same key. If not this field is set to blanks.

### 6.3.3 ROUTINES

The following subroutines are part of the INPUT-TRANSACTION main routine:

- PROCESS-INPUT-TRANSACTIONS SECTION - This paragraph defines the beginning of the SORT input procedure section which recieves control from the SORT statement. This paragraph will perform paragraph PROCESS-INPUT-CARDS until an end-of-file is detected on the input transaction data set.

- PROCESS-INPUT-CARDS - This paragraph reads a transaction from the input transaction data set, identifies the transaction type and builds the sortkey for this transaction. The transaction with the attached sortkey is released to COBOL SORT by means of the RELEASE statement.

- PROCESS-INPUT-CARDS-EOF - This paragraph is entered when an end-of-file is detected on the input transaction data set. An end-of-file type transaction is created and released to COBOL SORT. This transaction is used to stop the output routine processing.

- PROCESS-INPUT-TRANSACTION-END - This paragraph contains an EXIT statement only. Its purpose is to pass control back to COBOL sort.

The following subroutines are part of the WRITE-TRANSACTION main routine:

- PROCESS-OUTPUT-TRANSACTIONS SECTION - This paragraph defines the beginning of the SORT output procedure section which receives control from the SORT statement after the actual sort has been performed. Initialization is performed and the emission factors table is read. Program termination will occur if the emission factors table read was in error. Paragraph PROCESS-OUTPUT-CARDS is performed until an end-of-file is detected on the sorted data set.

- PROCESS-OUTPUT-CARDS - This paragraph reads a transaction from the sorted data set and passes control to one of the following five paragraphs depending on the transaction type. At end-of-file, control is passed to the PROCESS-OUTPUT-TRANS-END paragraph.

- PROCESS-INVALID-CARD - This paragraph outputs an error message for an invalid type of transaction.

- PROCESS-SKIP-CARD - This paragraph writes the transaction on the output transaction data set. All transactions other than the 21, 22 and 23 are processed by this paragraph.

- PROCESS-21-CARD - This paragraph moves the 21 transaction to working storage, saves the transaction key and converts the SCC number to internal format.

- PROCESS-22-CARD - This paragraph moves the 22 transaction to working storage and examines the transaction key and the code in the EF-SOURCE field. If correct an SCC search is performed.

- PROCESS-23-CARD - This paragraph moves the 23 transaction to working storage. If the SCC search was successful and EF-SOURCE contains a T, paragraph EMISSION-FACTORS-INSERTION is performed. If an A, paragraph POLID-INSERTION is performed. If neither T nor A nor the key check failed, the 23 transaction is written on the output transaction data set.

- PROCESS-OUTPUT-CARDS-END - This paragraph contains an EXIT statement only. Its purpose is to pass control back to the PROCESS-OUTPUT-TRANSACTIONS paragraph.

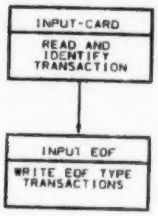
- SCC-SEARCH - This paragraph does a binary search of the SCC index entries in the first page of the emission factors table. The SCC number from the 21 transaction is used as the search argument. If found, the index entry is saved and the ash and/or sulfur percentage values in the index entry is inserted into the corresponding fields of the 21 transaction if those fields are zero.

- EMISSION-FACTORS-INSERTION - This paragraph cycles through the pollutant identification numbers in the 23 transaction. If non-zero, paragraph POLID-SEARCH is performed to find the corresponding emission factor value. If found, the value is inserted into the 23 transaction.

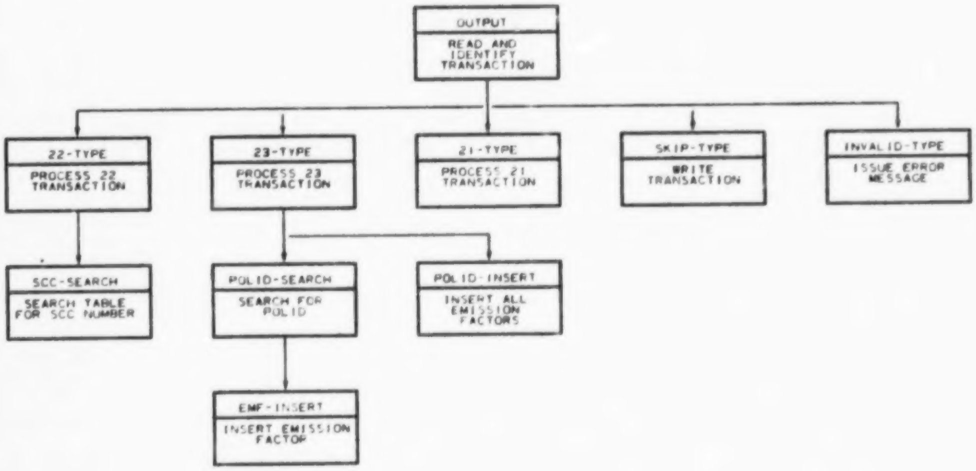
- POLID-SEARCH - This paragraph searches for the emission factor values associated with an SCC number.

- POLID-INSERTION - This paragraph inserts an emission factor value into a 23 transaction and writes the transaction on the output transaction data set.

Figures 6.3-2 and 6.3-3 illustrate the organization of the Emission Factors Insert routines.


INPUT-CARD
READ AND IDENTIFY TRANSACTION
INPUT EOF
WRITE EOF TYPE TRANSACTIONS

Emission Factors Insert Routine INPUT-TRANSACTION
Figure 6.3-2


OUTPUT
READ AND IDENTIFY TRANSACTION
22-TYPE
PROCESS 22 TRANSACTION
23-TYPE
PROCESS 23 TRANSACTION
21-TYPE
PROCESS 21 TRANSACTION
SKIP-TYPE
WRITE TRANSACTION
INVALID-TYPE
ISSUE ERROR MESSAGE
SCC-SEARCH
SEARCH TABLE FOR SCC NUMBER
POLID-SEARCH
SEARCH FOR POLID
POLID-INSERT
INSERT ALL EMISSION FACTORS
EMF-INSERT
INSERT EMISSION FACTOR

Emission Factors Insert Routine WRITE-TRANSACTION
Figure 6.3-3